

SUZUKI

VITARA

SUPPLEMENTARY SERVICE MANUAL FOR 5-DOOR MODEL

USE THIS MANUAL WITH:
VITARA SERVICE MANUAL (99500-60A10)

FOREWORD

This SUPPLEMENTARY SERVICE MANUAL is a supplement to VITARA SERVICE MANUAL (99500-60A10) and has been prepared exclusively for VITARA 5 DOOR MODEL.

Applicable model: VITARA 5 DOOR MODEL

It describes only different service information of 5 door model as compared with 3 door model (above VITARA SERVICE MANUAL).

Therefore, whenever servicing 5 door model, consult this supplement first. And for any section, item or description not found in this supplement, refer to the above mentioned SERVICE MANUAL.

When replacing parts or servicing by disassembling, it is recommended to use SUZUKI genuine parts, tools and service materials (lubricants, sealants, etc.) as specified in each description.

All information, illustrations and specifications contained in this literature are based on the latest product information available at the time of publication approval. And used as the main subject of description is the vehicle of standard specifications among others. Therefore, note that illustrations may differ from the vehicle being actually serviced. The right is reserved to make changes at any time without notice.

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SUZUKI MOTOR CORPORATION

TECHNICAL DEPARTMENT
AUTOMOBILE SERVICE DIVISION

SECTION 0A

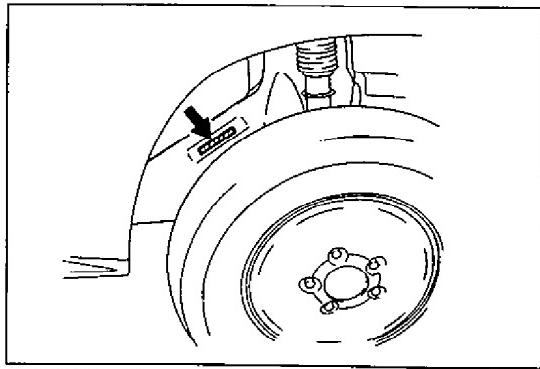
GENERAL INFORMATION

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60A50-0A-1-1S

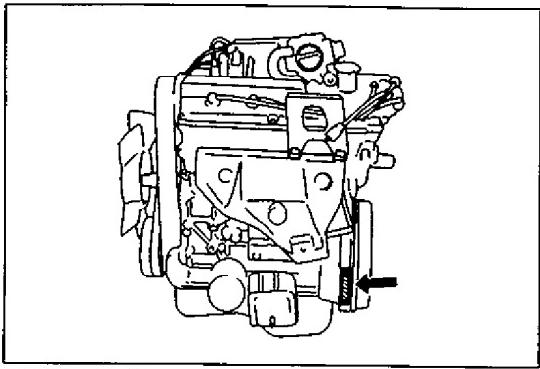
GENERAL INFORMATION



60A50-0A-1-3S

BODY NUMBER

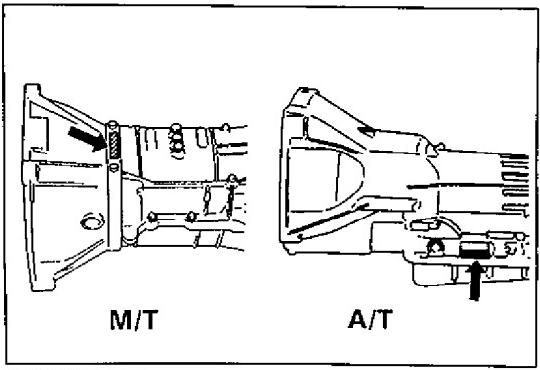
The vehicle body number is punched on the chassis inside the tire housing on the right front side.



60A50-0A-1-4S

ENGINE IDENTIFICATION NUMBER

The number is punched on the cylinder block.



60A50-0A-1-5S

TRANSMISSION IDENTIFICATION NUMBER

The number is located on the transmission case.

ABBREVIATIONS USED IN THIS MANUAL

A

ATDC	: After Top Dead Center
API	: American Petroleum Institute
ATF	: Automatic Transmission Fluid
ALR	: Automatic Locking Retractor
AC	: Alternating Current
A/T	: Automatic Transmission
ATS	: Air Temperature Sensor
A/C	: Air-Conditioner
AFM	: Air Flow Meter
AFS	: Air Flow Sensor
ABDC	: After Bottom Dead Center
A/F	: Air Fuel Mixture Ratio
ALDL	: Assembly Line Diagnostic Link
ADR	: Australian Design Rule
A-ELR	: Automatic-Emergency Locking Retractor

B

BTDC	: Before Top Dead Center
BBDC	: Before Bottom Dead Center
BVSV	: Bimetal Vacuum Switching Valve

C

CAS	: Crank Angle Sensor
CPU	: Central Processing Unit
CO	: Carbon Monoxide
CB	: Circuit Breaker
CMVSS	: Canadian Motor Vehicle Safety Standard
CRS	: Child Restraint System

D

DRL	: Daytime Running Light
DERM	: Diagnostic Energy Reserve Module
DC	: Direct Current
DOJ	: Double Offset Joint
DOT	: Department of Transportation
DSPV	: Deceleration Sensing Proportioning Valve

E

ECM	: Electronic Control Module
EGR	: Exhaust Gas Recirculation
ESA	: Electronic Spark Advance
ECU	: Electronic Control Unit
EPA	: Environmental Protection Agency
ELR	: Emergency Locking Retractor

F

FMVSS	: Federal Motor Vehicle Safety Standard
4WD	: 4 Wheel Drive Vehicles

H

HAC	: High Altitude Compensator
HIC	: Hot Idle Compensator
HC	: Hydrocarbons

I

ISC	: Idle Speed Control
IG	: Ignition
ISO	: International Standards Organization

L

LSD	: Limited Slip Differential
LSPV	: Load Sensing Proportioning Valve
LCD	: Liquid Crystal Display
LH	: Left Hand Steering Vehicle

M

M/T	: Manual Transmission
Min	: Minimum
Max	: Maximum

N

NHTSA	: National Highway Traffic Safety Organization
NOx	: Nitrogen Oxides

O

OHC	: Over Head Camshaft
O/D	: Overdrive

P

PCV	: Positive Crankcase Ventilation
P/S	: Power Steering
PTC	: Positive Temperature Coefficient
PWM	: Pulse Width Modulation

R

REGTS : Recirculated Exhaust Gas
Temperature Sensor
RWAL : Rear Wheel Anti-Lock Brake
RH : Right Hand Steering Vehicle

S

SAE : Society of Automative Engineers
SIR : Supplemental Inflatable Restraint
SOHC : Single Over Head Camshaft

T

TB : Throttle Body
TPS : Throttle Position Sensor
TS : Throttle Switch
TVSV : Thermal Vacuum Switching Valve
2WD : 2 Wheel Drive Vehicles

V

VSV : Vacuum Switching Valve
VIN : Vehicle Identification Number
VTV : Vacuum Transmitting Valve
VSS : Vehicle Speed Sensor

W

WTG : Water Temperature Gauge
WTS : Water Temperature Sensor
WOT : Wide Open Throttle

SECTION OB

MAINTENANCE AND LUBRICATION

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60A50-OB-1-1S

MAINTENANCE SCHEDULE

(For Vehicle with Oxygen Sensor)

MAINTENANCE SCHEDULE UNDER NORMAL DRIVING CONDITIONS

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 80,000 km (48,000 miles) mileage. Beyond 80,000 km (48,000 miles), carry out the same services at the same intervals respectively.								
	km (x 1,000)	10	20	30	40	50	60	70	80
	miles (x 1,000)	6	12	18	24	30	36	42	48
	Months	6	12	18	24	30	36	42	48
ENGINE									
1-1. Water pump (fan) drive belt (tension, damage)	—	—	—	I	—	—	—	—	R
1-2. Camshaft timing belt	—	—	—	—	—	—	—	—	I
1-3. Valve lash (clearance)	—	I	—	I	—	I	—	I	
1-4. Engine oil and oil filter	R	R	R	R	R	R	R	R	R
1-5. Engine coolant	—	—	—	R	—	—	—	—	R
1-6. Cooling system hoses and connections	—	—	—	I	—	—	—	—	I
1-7. Exhaust pipes and mountings (except catalyst)	—	—	—	I	—	—	—	—	I&(R)
IGNITION SYSTEM									
2-1. Ignition wiring (high tension cords)	—	—	—	—	—	—	—	—	R
2-2. Distributor cap and rotor (crack, wear)	—	—	—	I	—	—	—	—	I
2-3. Spark plugs	—	—	—	—	R	—	—	—	
FUEL SYSTEM									
3-1. Air cleaner filter element	I	I	I	R	I	I	I	I	R
3-2. Fuel tank cap, fuel lines and connections	—	—	—	I	—	—	—	—	I&(R)
3-3. Fuel filter	—	—	—	**R	—	—	—	—	R
EMISSION CONTROL SYSTEM									
4-1. Oxygen sensor	Replace every 80,000 km or 60 months								
4-2. PCV valve	Inspect every 80,000 km or 60 months								
4-3. Fuel vapor storage (Evaporative Emission control) system	Inspect every 80,000 km or 60 months								
ELECTRICAL SYSTEM									
5-1. Wiring harness connections and headlights	—	—	—	I	—	—	—	—	I

NOTES:

"R": Replace or change

"I": Inspect and correct or replace if necessary

- Item 1-7 (R) is applicable to exhaust mounting rubber only.
- Item 3-2 (R) is applicable to fuel tank cap only.
- Item 3-3 **R is recommended maintenance item.
- For Sweden, item 2-1, 4-1, 4-2 and 4-3 should be performed by odometer reading only.

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 80,000 km (48,000 miles) mileage. Beyond 80,000 km (48,000 miles), carry out the same services at the same intervals respectively.								
	km (x 1,000)	10	20	30	40	50	60	70	80
	miles (x 1,000)	6	12	18	24	30	36	42	48
	Months	6	12	18	24	30	36	42	48
CHASSIS AND BODY									
6- 1. Clutch (For manual transmission)	—	I	—	I	—	I	—	I	
6- 2. Brake discs and pads (front) Brake drums and shoes (rear)	—	I	—	I	—	I	—	I	
6- 3. Brake hoses and pipes	—	I	—	I	—	I	—	I	
6- 4. Brake fluid	—	I	—	R	—	I	—	R	
6- 5. Brake pedal	—	I	—	I	—	I	—	I	
6- 6. Brake lever and cable	—	I	—	I	—	I	—	I	
6- 7. Tires	I	I	I	I	I	I	I	I	
6- 8. Wheel discs and free wheeling hubs (if equipped)	I	I	I	I	I	I	I	I	
6- 9. Wheel bearings	—	I	—	*I	—	I	—	*I	
6-10. Suspension system	*I	I	—	I	—	I	—	I	
6-11. Propeller shafts	—	I	—	I	—	I	—	I	
6-12. Manual transmission oil	R	I	I	R	I	I	I	R	
6-13. Automatic transmission	Fluid level	I	I	I	I	I	I	I	
	Fluid change	Replace every 160,000 km (100,000 miles)							
	Fluid hose	—	—	—	—	—	R	—	—
6-14. Transfer and differential oil	R	I	I	R	I	I	I	R	
6-15. Steering system	I	I	I	I	I	I	I	I	
6-16. Power steering (if equipped)	I	I	I	I	I	I	I	I	
6-17. Door hinges	L	L	L	L	L	L	L	L	

NOTES:

"R": Replace or change

"I": Inspect and correct or replace if necessary

"L": Lubricate

"T": Tighten to the specified torque

- Item 6-9 *I is applicable to not only rattled wear but also their grease.

- Item 6-10 *I should be performed at 10,000 km only.

MAINTENANCE RECOMMENDED UNDER SEVERE DRIVING CONDITIONS

If the vehicle is usually used under the conditions corresponding to any severe condition code given below, it is recommended that applicable maintenance operation be performed at the particular interval as given in the chart below.

Severe condition code

- | | |
|---|---|
| A — Towing a trailer | E — Driving in extremely cold weather and/or salted roads |
| B — Repeated short trips | F — Repeated short trips in extremely cold weather |
| C — Driving on rough and/or muddy roads | |
| D — Driving on dusty roads | |

Severe Condition Code	Maintenance	Maintenance Operation	Maintenance Interval
— C D — —	Water pump (fan) drive belt	I	Every 12,000 miles (20,000 km) or 12 months
		R	Every 24,000 miles (40,000 km) or 24 months
A — — D E F	Engine oil and oil filter	R	Every 3,000 miles (5,000 km) or 3 months
A B C — E —	Exhaust pipes and mounting	I	Every 6,000 miles (10,000 km) or 6 months
— — — D — —	Air cleaner filter element *1	I	Every 1,500 miles (2,500 km)
		R	Every 12,000 miles (20,000 km) or 12 months
A B C D — —	Brake discs and pads (Front) Brake drums and shoes (Rear)	I	Every 6,000 miles (10,000 km) or 6 months
A B C — — —	Propeller shafts	I	Every 6,000 miles (10,000 km) or 6 months
A — C — — —	Manual transmission, transer and differential oil	R	Every 12,000 miles (20,000 km) or 12 months
— B C — — F	Automatic transmission fluid	R	Every 12,000 miles (20,000 km) or 12 months
— — C — — —	Drive axle shaft boots	I	Every 6,000 miles (10,000 km) or 6 months
— — C — — —	Bolts and nuts on chassis	T	Every 6,000 miles (10,000 km) or 6 months

NOTES:

"I": Inspect and correct or replace if necessary

"T": Tighten to the specified torque

"R": Replace or change

- *1: Inspect or replace more frequently if the vehicle is used under dusty conditions.

MAINTENANCE SCHEDULE

(For Vehicle not Equipped with Oxygen Sensor)

MAINTENANCE SCHEDULE UNDER NORMAL DRIVING CONDITIONS

Interval: This interval should be judged by odometer reading or months, whichever comes first.		This table includes services as scheduled up to 80,000 km (48,000 miles) mileage. Beyond 80,000 km (48,000 miles), carry out the same services at the same intervals respectively.													
		km (x 1,000)	10	20	30	40	50	60	70	80					
		miles (x 1,000)	6	12	18	24	30	36	42	48					
		Months	6	12	18	24	30	36	42	48					
ENGINE															
1-1. Water pump (fan) drive belt (tension, damage)					-	-	-	I	-	-	R				
1-2. Blank															
1-3. Valve lash (clearance)					-	I	-	I	-	I	-	I			
1-4. Engine oil filter					R	R	R	R	R	R	R				
1-4-1. Engine oil	API Grade SD, SE, SF or SG			Replace every 10,000 km (6,000 miles)											
	API Grade SC			Replace very 5,000 km (3,000 miles)											
1-5. Engine coolant					-	-	-	R	-	-	R				
1-6. Cooling system hoses and connections					-	I	-	I	-	I	-	I			
1-7. Exhaust pipes and mountings (leakage, damage, tightness)					-	I	-	I	-	I	-	I			
IGNITION SYSTEM															
2-1. Ignition wiring (high tension cords)					-	I	-	I	-	I	-	I			
2-2. Distributor cap and rotor (crack, wear)					-	I	-	I	-	I	-	I			
2-3. Spark plugs	When unleaded fuel is used			-	R	-	R	-	R	-	R				
	When leaded fuel is used, refer to "Severe Driving Condition" schedule														
FUEL SYSTEM															
3-1. Air cleaner filter element					I	I	I	R	I	I	I	R			
3-2. Fuel tank cap, fuel lines and connections					-	-	-	I	-	-	-	I&(R)			
3-3. Fuel filter					-	-	-	R	-	-	-	R			
EMISSION CONTROL SYSTEM															
4-1. Crankcase ventilation hoses and connections					-	I	-	I	-	I	-	I			
4-2. PCV valve					-	-	-	I	-	-	-	I			
4-3. Fuel vapor storage system, hoses and connections					-	I	-	I	-	I	-	I			
ELECTRICAL SYSTEM															
5-1. Wiring harness connections and headlights					-	I	-	I	-	I	-	I			

NOTES:

"R": Replace or change

"I": Inspect and correct or replace if necessary

• Item 3-2 (R) is applicable to fuel tank cap only.

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 80,000 km (48,000 miles) mileage. Beyond 80,000 km (48,000 miles), carry out the same services at the same intervals respectively.								
	km (x 1,000)	10	20	30	40	50	60	70	80
	miles (x 1,000)	6	12	18	24	30	36	42	48
	Months	6	12	18	24	30	36	42	48
CHASSIS AND BODY									
6- 1. Clutch (For manual transmission)	—	I	—	I	—	I	—	I	
6- 2. Brake discs and pads (front) Brake drums and shoes (rear)	—	I	—	I	—	I	—	I	
6- 3. Brake hoses and pipes	—	I	—	I	—	I	—	I	
6- 4. Brake fluid	—	I	—	R	—	I	—	R	
6- 5. Brake pedal	—	I	—	I	—	I	—	I	
6- 6. Brake lever and cable	—	I	—	I	—	I	—	I	
6- 7. Tires	I	I	I	I	I	I	I	I	
6- 8. Wheel discs and free wheeling hubs (if equipped)	I	I	I	I	I	I	I	I	
6- 9. Wheel bearings	—	I	—	*I	—	I	—	*I	
6-10. Suspension system	*I	I	—	I	—	I	—	I	
6-11. Propeller shafts	—	I	—	I	—	I	—	I	
6-12. Manual transmission oil	R	I	I	R	I	I	I	R	
6-13. Automatic transmission	Fluid level	I	I	I	I	I	I	I	I
	Fluid change	Replace every 160,000 km (100,000 miles)							
	Fluid hose	—	—	—	—	—	R	—	—
6-14. Transfer and differential oil	R	I	I	R	I	I	I	R	
6-15. Steering system	I	I	I	I	I	I	I	I	
6-16. Power steering (if equipped)	I	I	I	I	I	I	I	I	
6-17. Door hinges	L	L	L	L	L	L	L	L	

NOTES:**"R"**: Replace or change**"I"** : Inspect and correct or replace if necessary**"L"**: Lubricate**"T"**: Tighten to the specified torque

- Item 6-9 *I is applicable to not only rattled wear but also their grease.
- Item 6-10 *I should be performed at 10,000 km only.

MAINTENANCE RECOMMENDED UNDER SEVERE DRIVING CONDITIONS

If the vehicle is usually used under the conditions corresponding to any severe condition code given below, it is recommended that applicable maintenance operation be performed at the particular interval as given in the chart below.

Severe condition code

A — Towing a trailer

E — Driving in extremely cold weather and/or salted roads

B — Repeated short trips

F — Repeated short trips in extremely cold weather

C — Driving on rough and/or muddy roads

G — Leaded fuel use

D — Driving on dusty roads

Severe Condition Code	Maintenance	Maintenance Operation	Maintenance Interval
A B C D — F G	Spark plugs	R	Every 6,000 miles (10,000 km) or 6 months
A — — D E F	Engine oil and oil filter	R	Every 3,000 miles (5,000 km) or 3 months
— — C D — —	Water pump (Fan) drive belt	I	Every 12,000 miles (20,000 km) or 12 months
		R	Every 24,000 miles (40,000 km) or 24 months
A B C — E —	Exhaust pipes and mountings	I	Every 6,000 miles (10,000 km) or 6 months
— — — D — —	Air cleaner filter element *1	I	Every 1,500 miles (2,500 km) or more frequently if necessary
		R	Every 12,000 miles (20,000 km) or 12 months or more frequently if necessary
A B C D — —	Brake discs and pads (Front) Brake drums and shoes (Rear)	I	Every 6,000 miles (10,000 km) or 6 months
A B C — — —	Propeller shafts	I	Every 6,000 miles (10,000 km) or 6 months
A — C — — —	Manual transmission, transfer and differential oil	R	Every 12,000 miles (20,000 km) or 12 months after first replacement at 10,000 km
— B C — — F	Automatic transmission fluid	R	Every 12,000 miles (20,000 km) or 12 months
— — C — — —	Drive axle shaft boots	I	Every 6,000 miles (10,000 km) or 6 months
— — C — — —	Bolts and nuts on chassis	T	Every 6,000 miles (10,000 km) or 6 months

NOTES:

"I" — Inspect and correct or replace if necessary

"T" — Tighten to the specified torque

"R" — Replace or change

"L" — Lubricate

*1: Inspect more frequently if the vehicle is used under dusty conditions

MAINTENANCE SERVICE

ENGINE

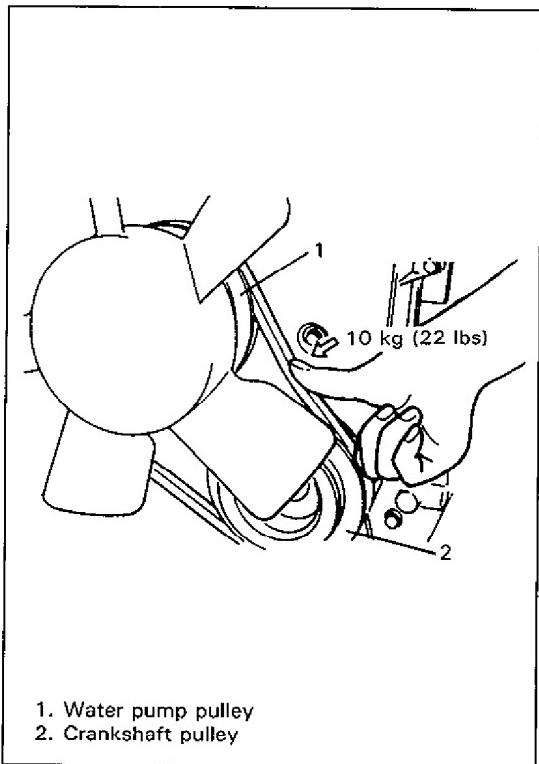
ITEM 1-1

Water Pump Belt Inspection and Replacement

WARNING:

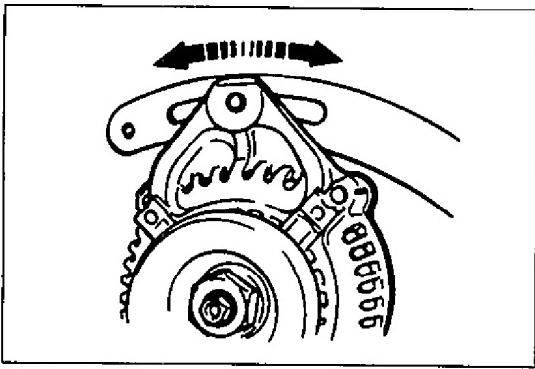
All inspection and replacement are to be performed with
ENGINE NOT RUNNING.

60A50-OB-8-1S



1. Water pump pulley
2. Crankshaft pulley

60A50-OB-8-2S

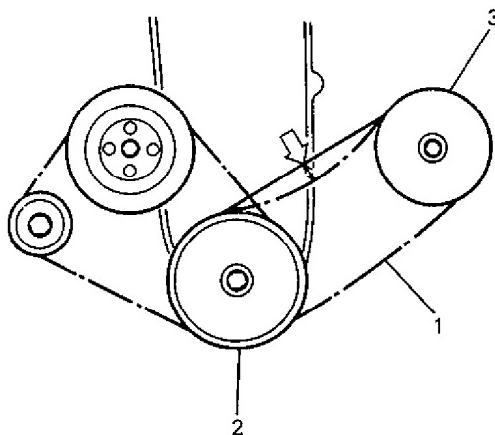


60A50-OB-8-4S

3. If belt is too tight or too loose, adjust it to specification by adjusting alternator position.
4. Tighten alternator adjusting bolt and pivot bolts.
5. Connect negative cable to battery.

Replacement

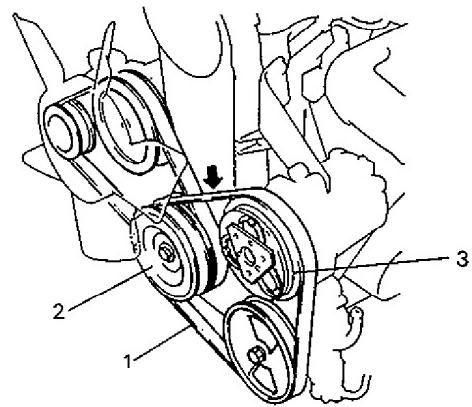
Replace belt. Refer to Section 6B for replacement procedure of pump belt.

Vehicle with A/C**A/C Compressor and/or Power Steering Pump Drive Belt
(If equipped)**

Inspect belt for wear, deterioration and tension.

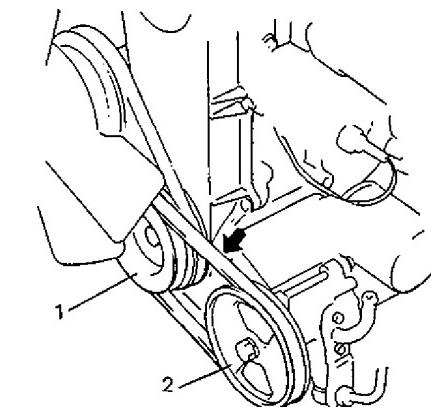
A/C compressor drive belt tension:

8–9.5 mm (0.31–0.37 in.) deflection under 10 kg or 22 lb pressure

Vehicle with A/C and P/S

1. Compressor drive belt
2. Crankshaft pulley
3. Compressor pulley

60A50-0B-9-1S

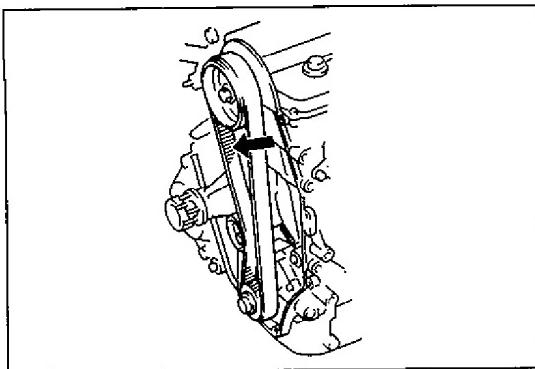
Vehicle with P/S

1. Crankshaft pulley
2. P/S pump pulley

Power steering pump drive belt tension:

6–9 mm (0.24–0.35 mm) deflection under 10 kg or 22 lb pressure

60A50-0B-9-4S

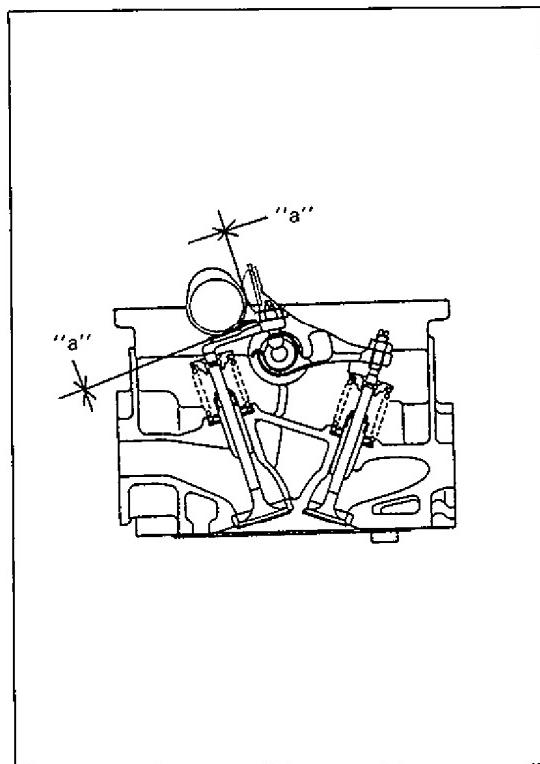


60A50-OB-10-1S

ITEM 1-2**Camshaft Timing Belt Inspection**

(Applicable to only vehicle with oxygen sensor)

1. Remove timing belt outside cover, referring to SECTION 6A1.
2. Inspect belt for wear or crack. If any wear or crack is found on belt, replace it.
3. Install timing belt outside cover, pulleys, etc., referring to SECTION 6A1.



60A50-OB-10-2S

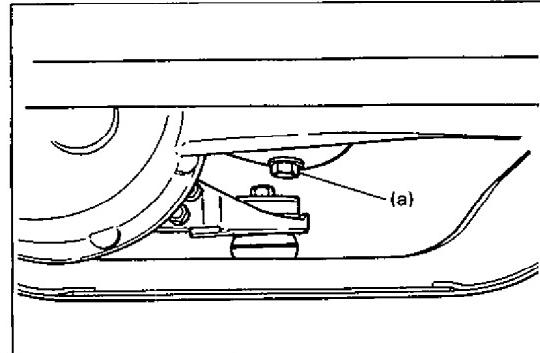
ITEM 1-3**Valve Lash Inspection**

1. Remove cylinder head cover.
2. Inspect intake and exhaust valve lash and adjust as necessary.
Refer to SECTION 6A1 for valve lash inspection and adjustment procedure.

Valve lash (gap "a") specifica- tion		When cold (Coolant tempera- ture is 15–25°C or 59–77°F)	When hot (Coolant tempera- ture is 60–68°C or 140–154°F)
	Intake	0.08–0.12 mm (0.0031–0.0047 in)	0.12–0.16 mm (0.0047–0.0063 in)
Exhaust			

3. Install cylinder head cover and tighten bolts to specification.

60A50-OB-10-4S



60A50-OB-10-5S

ITEM 1-4 and 1-4-1**Engine Oil and Filter Change**

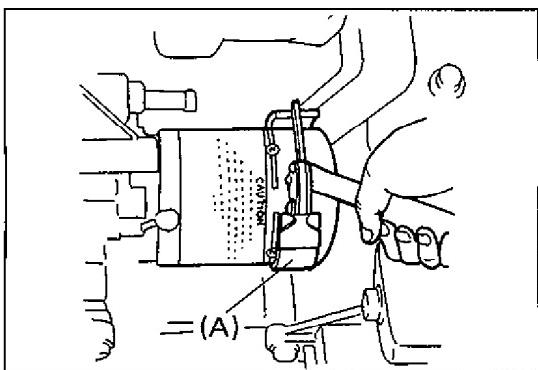
Before draining engine oil, check engine for oil leakage. If any evidence of leakage is found, make sure to correct defective part before proceeding to the following work.

1. Drain engine oil by removing drain plug.

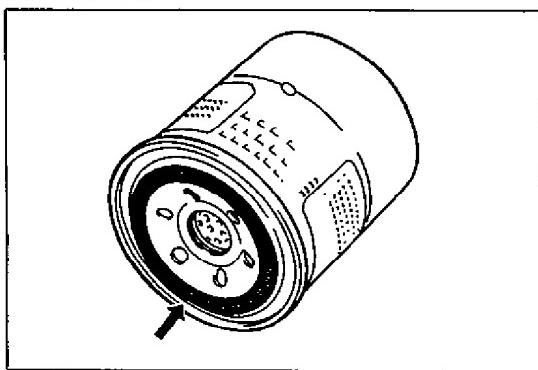
2. After draining oil, wipe drain plug clean. Reinstall drain plug, and tighten it securely as specified below.

Tightening Torque

(a): 30–40 N·m (3.0–4.0 kg·m, 22.0–28.5 lb·ft)



60A50-0B-11-1S



60A50-0B-11-2S

3. Loosen oil filter by using oil filter wrench (special tool).

Special Tool

(A): 09915-47310

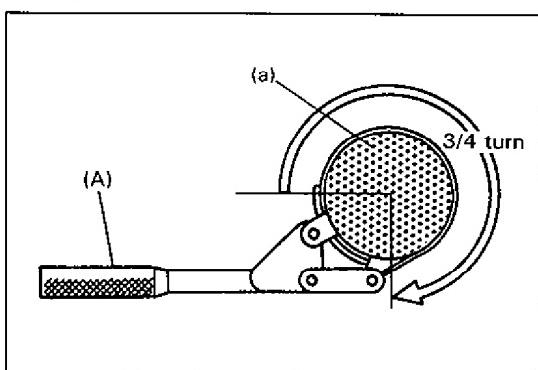
4. Apply engine oil to oil filter "O" ring.

5. Screw new filter on oil filter stand by hand until filter "O" ring contacts mounting surface.

CAUTION:

To tighten oil filter properly, it is important to accurately identify the position at which filter "O" ring first contacts mounting surface.

60A50-0B-11-3S



60A50-0B-11-4S

6. Tighten filter 3/4 turn from the point of contact with mounting surface using an oil filter wrench.

Special Tool

(A): 09915-47310

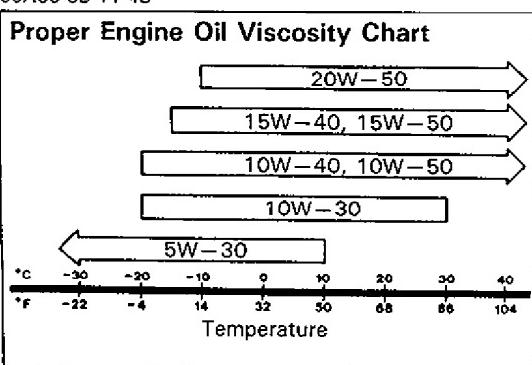
Tightening Torque

(a): 12–16 N·m (1.2–1.6 kg·m, 8.5–11.5 lb·ft)

7. Replenish oil until oil level is brought to FULL level mark on dipstick. (about 4.2 liters or 8.9/7.4 US/Imp pt.). Filler inlet is atop the cylinder head cover.

It is recommended to use engine oil of SE, SF or SG class. Select the appropriate oil viscosity according to the chart at the left.

For temperature between -4°F (-20°C) and 86°F (30°C), it is highly recommended to use SAE 10W–30 oil.



60A50-0B-11-5S

Engine oil capacity

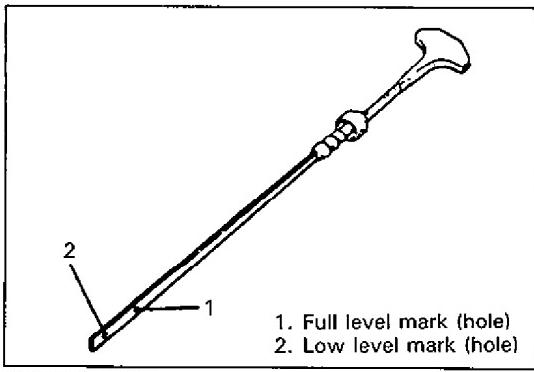
Oil pan capacity	about 4.0 liters (8.4/7.0 US/Imp pt.)
Oil filter capacity	about 0.2 liters (0.4/0.3 US/Imp pt.)
Others	about 0.3 liters (0.6/0.5 US/Imp pt.)
Total	about 4.5 liters (9.5/7.9 US/Imp pt.)

NOTE:

Engine oil capacity is specified as above.

However, note that amount of oil required when actually changing oil may somewhat differ from the data in above table depending on various conditions (temperature, viscosity, etc.).

60A50-0B-12-1S



60A50-0B-12-3S

- Start engine and run it for three minutes. Stop it and wait another three minutes before checking oil level. Add oil, as necessary, to bring oil level to FULL level mark on dipstick.

NOTE:

Steps 1—7 outlined above must be performed with ENGINE NOT RUNNING. For step 8, be sure to have adequate ventilation while engine is running.

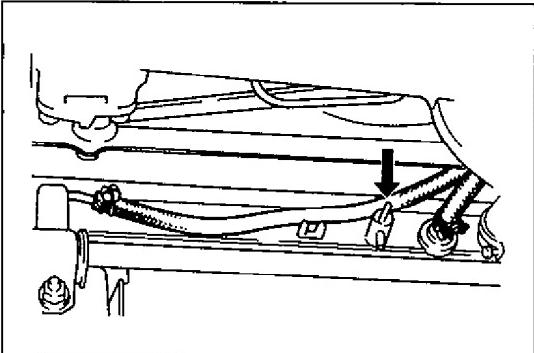
ITEM 1-5

ENGINE Coolant Change

WARNING:

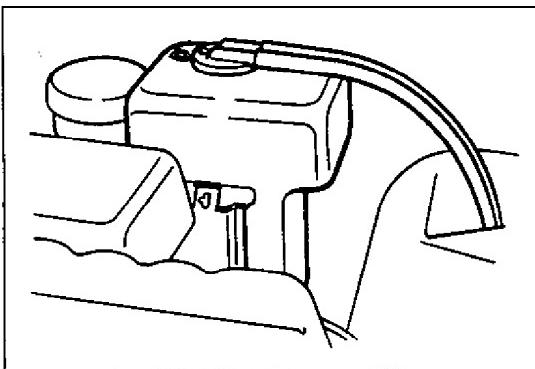
To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

60A50-0B-12-4S



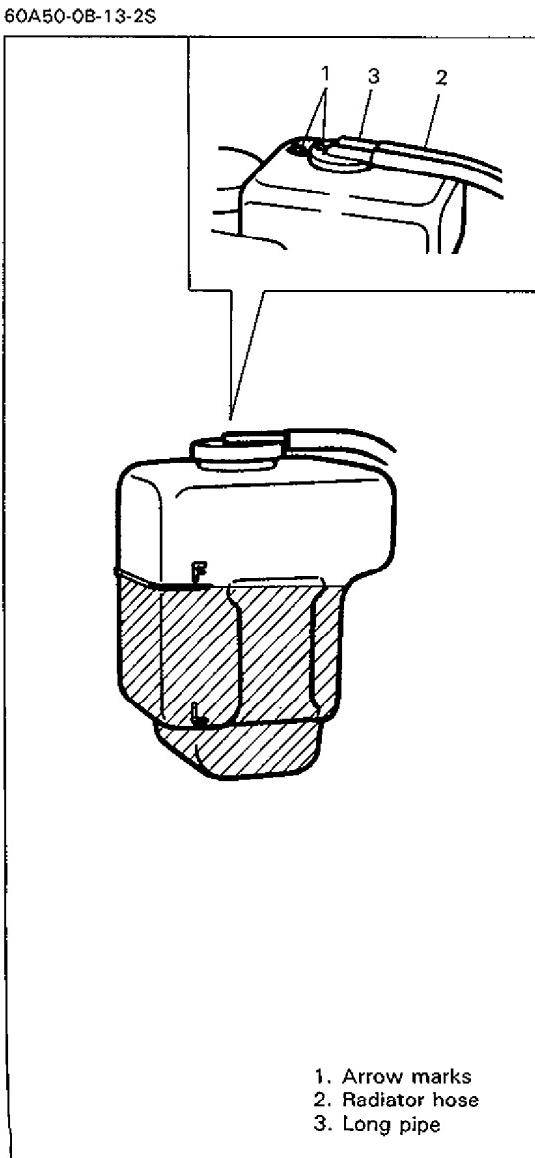
60A50-0B-12-5S

- Remove radiator cap when engine is cool.
- Loosen radiator drain plug to drain coolant and then tighten plug securely.



60A50-OB-13-1S

3. Remove reservoir tank, which is on the side of resonator, and drain.
4. Reinstall reservoir tank.



60A50-OB-13-2S

5. Fill radiator with specified amount of coolant, and run engine for 2 or 3 minutes at idle.

This drives out any air which may still be trapped within cooling system. **STOP ENGINE.** Add coolant as necessary until coolant level reaches filler throat of radiator. Reinstall radiator cap.

6. Add coolant to reservoir tank so that its level aligns with Full mark. Then, reinstall cap aligning arrow marks on tank and cap.

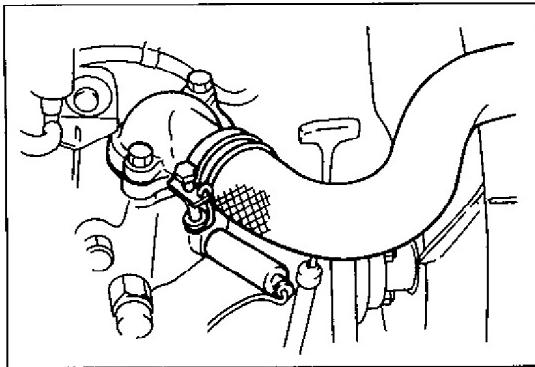
CAUTION:

When changing engine coolant, use mixture of 50% water and 50% ETHYLENE GLYCOL BASE COOLANT (ANTIFREEZE/ANTICORROSION COOLANT) for the market where ambient temperature falls lower than -16°C (3°F) in winter and mixture of 70% water and 30% ETHYLENE GLYCOL BASE COOLANT (ANTIFREEZE/ANTICORROSION COOLANT) for the market where ambient temperature doesn't fall lower than -16°C (3°F).

Even in a market where no freezing temperature is anticipated, mixture of 70% water and 30% ETHYLENE GLYCOL BASE COOLANT (ANTIFREEZE/ANTICORROSION COOLANT) should be used for the purpose of corrosion protection and lubrication.

Check to make sure that radiator hose is connected to long pipe. Connection to wrong pipe will cause engine overheating.

60A50-OB-13-3S



60A50-OB-14-1S

ITEM 1-6**Cooling System Hose and Connections
Inspection**

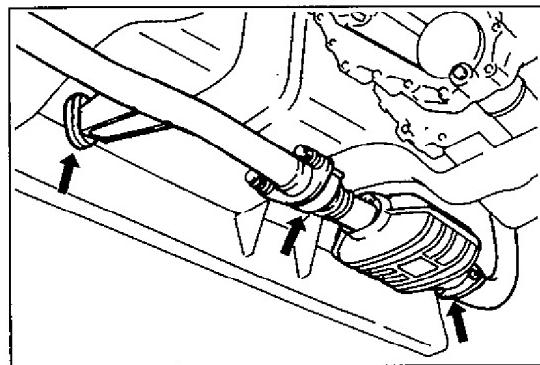
1. Visually inspect cooling system hoses for any evidence of leakage and cracks. Examine them for damage, and check connection clamps for tightness.
2. Replace all hoses which show evidence of leakage, cracks or other damage. Replace all clamps which cannot maintain proper tightness.

ITEM 1-7**Exhaust Pipes and Mountings
Inspection****WARNING:**

To avoid danger of being burned, do not touch exhaust system when it is still hot.

Any service on exhaust system should be performed when it is cool.

60A50-OB-14-2S



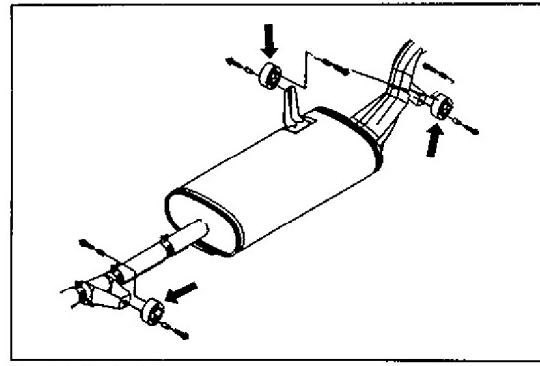
60A50-OB-14-3S

When carrying out periodic maintenance, or the vehicle is raised for other service, check exhaust system as follows:

- Check rubber mountings for damage, deterioration, and out of position.
- Check exhaust system for leakage, loose connections, dents, and damages. If bolts or nuts are loose, tighten them to specification. Refer to SECTION 6K (page 6K-2) for torque specification of bolts and nuts.

- Check nearby body areas for damaged, missing, or mis-positioned parts, open seams, holes, loose connections or other defects which could permit exhaust fumes to seep into vehicle.
- Make sure that exhaust system components have enough clearance from underbody to avoid overheating and possible damage to floor or carpet.
- Any defects should be fixed at once.

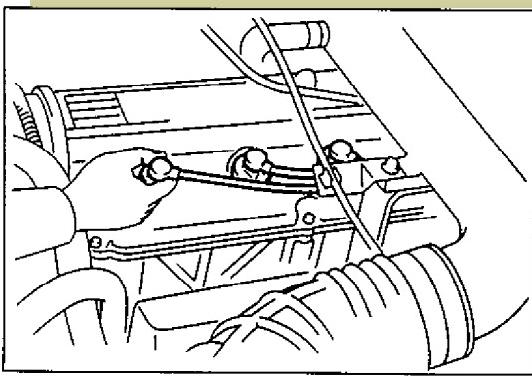
60A50-OB-14-4S



60A50-OB-14-5S

Mounting replacement (Vehicle with oxygen sensor)

Replace muffler rubber mountings with new ones periodically. Refer to SECTION 6K for installation.



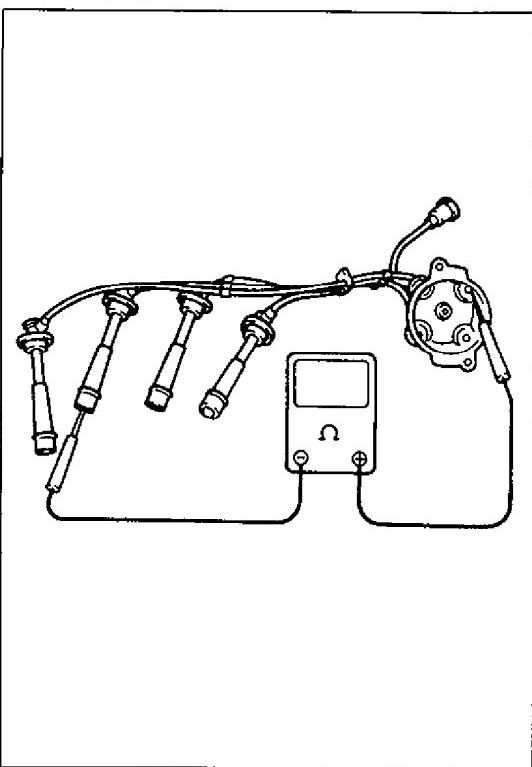
60A50-OB-15-1S

IGNITION SYSTEM

ITEM 2-1

Ignition Wiring Replacement (Vehicle with oxygen sensor)

1. Disconnect high tension cords from spark plugs, ignition coil and distributor.
2. Connect new high tension cords and clamp them securely. DO NOT push cords for connection. Push boots.



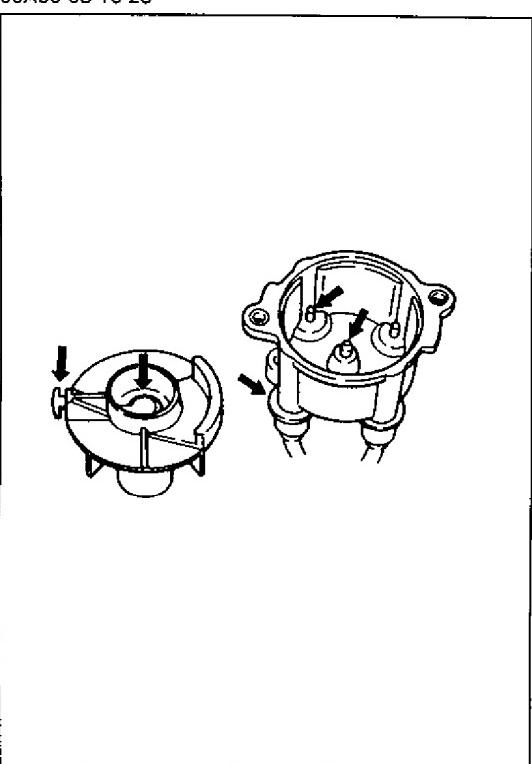
60A50-OB-15-2S

Ignition Wiring Inspection (Vehicle not equipped with oxygen sensor)

1. Inspect high-tension cords for cracks and check that their connections secure.
2. Measure resistance of high-tension cords.
Refer to SECTION 6F1 for checking procedure.
3. Replace high-tension cords that show evidence of deterioration.

NOTE:

Check to make sure that each of the high-tension cord terminals and connections is secure and fully inserted into its mating component. Any burnt fitting must be replaced.



60A50-OB-15-4S

ITEM 2-2

Distributor Cap and Rotor Inspection

1. Inspect distributor cap and rubber caps for cracks.
2. Inspect center electrode and terminals for wear.
3. Inspect rotor for cracks, and its electrode for wear.
4. Repair or replace as necessary any component which is found to be in malcondition as described above.

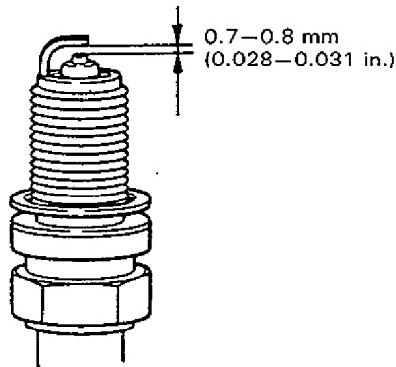
NOTE:

Dust and stains found within distributor can be cleaned by using a dry, soft cloth.

ITEM 2-3**Spark Plugs Replacement**

1. Disconnect high-tension cords from spark plugs. Make sure to pull only on spark plug caps.
2. Using a spark plug wrench, loosen and remove plugs.

60A50-OB-16-1S



3. Install new spark plugs.

NOTE:

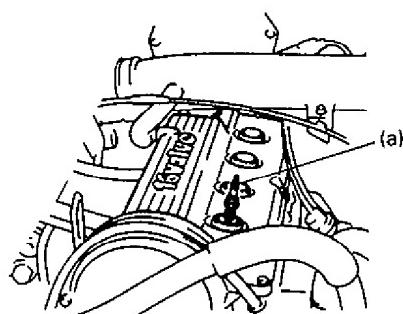
Make sure to use new plugs of specified heat range and size.

PLUG SPECIFICATION

Maker	Type
NGK	BKR6E or BK6E
Nippondenso	K20PR-U or K20P-U

As can be seen in above table, there are two types of spark plugs for this vehicle, one without R included in its code and the other with R. Which one is used depends on countries. Look at the label attached to the vehicle. If originally equipped plug was with R included in its code, replacement plug should have R in its code, too.

60A50-OB-16-2S



4. Tighten spark plugs to specified torque.

Tightening Torque

(a): 20–30 N·m (2.0–3.0 kg·m, 14.5–21.5 lb·ft)

5. Connect high tension cords to spark plugs. DO NOT push cords for connection. Push boots.

60A50-OB-16-4S

FUEL SYSTEM

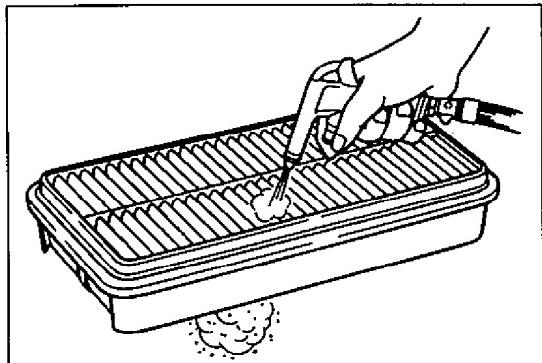
ITEM 3-1

Air Cleaner Element Inspection and Replacement

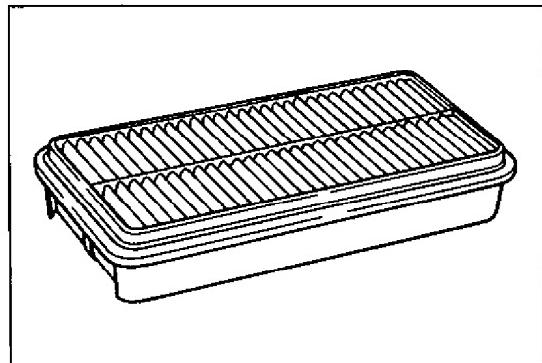
Inspection and cleaning

1. Remove air cleaner upper case.
2. Take cleaner element out of air cleaner case.

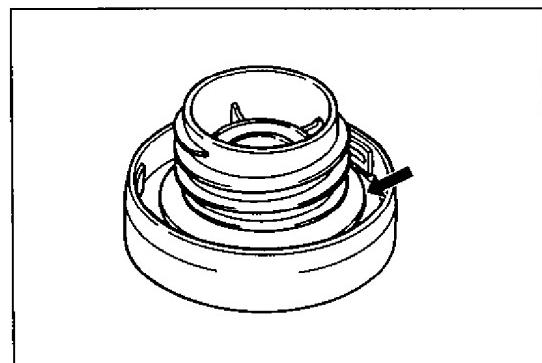
60A50-0B-17-1S



60A50-0B-17-2S



60A50-0B-17-3S



3. Blow off dust by blowing compressed air from air outlet side of element (i.e., the side facing up when installed in air cleaner case).
4. Install element to air cleaner case.
5. Install air cleaner upper case and clamp it securely.

Replacement

1. Remove air cleaner upper case.
2. Take cleaner element out of air cleaner case.
3. Install new cleaner element into cleaner case.
4. Install upper case and clamp it securely.

ITEM 3-2

Fuel Tank Cap, Fuel Lines and Connections Inspection

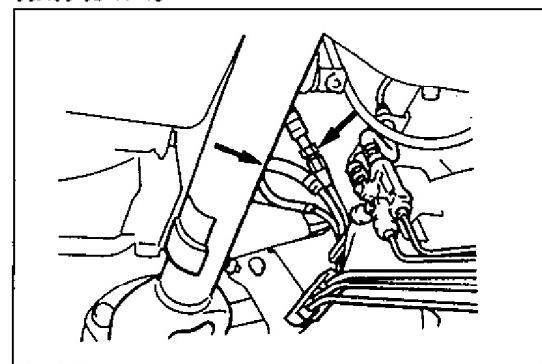
1. Visually inspect gasket of fuel tank cap. If it is damaged or deteriorated, replace it with new one.

2. Visually inspect fuel lines and connections for evidence of fuel leakage, hose cracking, and damage. Make sure all clamps are secure.

Repair leaky joints, if any.

Replace hoses that are suspected of being cracked.

60A50-0B-17-4S



Fuel tank cap replacement

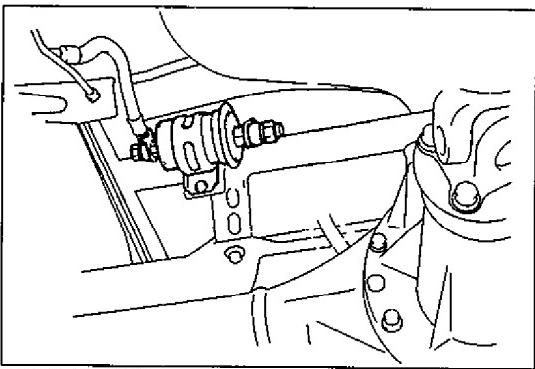
Replace tank cap with new one periodically.

60A50-0B-18-1S

ITEM 3-3**Fuel Filter Replacement****WARNING:**

This work must be performed in a well ventilated area and away from any open flames (such as gas hot water heaters).

60A50-0B-18-2S



60A50-0B-18-3S

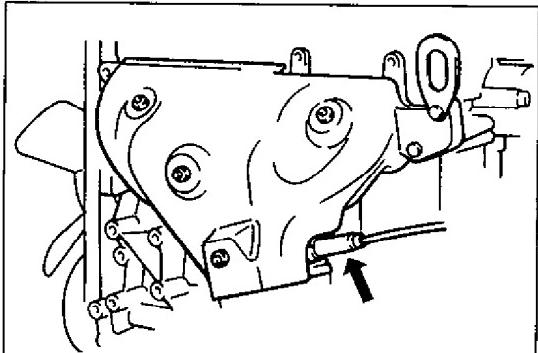
Fuel filter is located at the front part of fuel tank, inside the right-hand side of chassis.

Replace fuel filter with new one periodically, referring to SECTION 6C for removal and installation.

EMISSION CONTROL SYSTEM**ITEM 4-1****Oxygen Sensor Replacement (If equipped)****WARNING:**

To avoid danger of being burned, do not touch exhaust system when it is still hot. This work should be performed when it is cool.

60A50-0B-18-4S



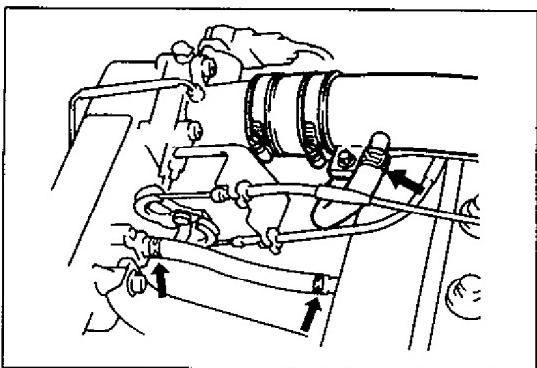
Replace oxygen sensor with new one periodically, referring to SECTION 6E1 for removal and installation.

60A50-0B-18-5S

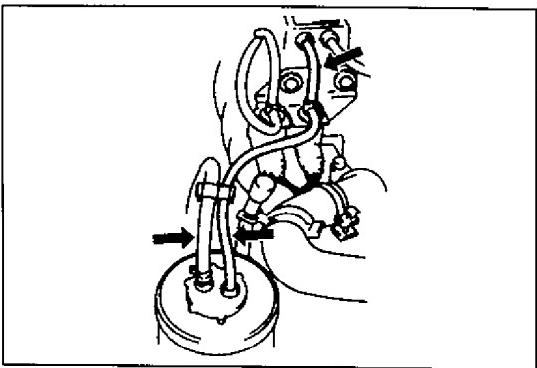
ITEM 4-1 (Vehicle not equipped with oxygen sensor)**Crankcase Ventilation Hoses and Connections Inspection**

Refer to following item 4-2, PCV VALVE INSPECTION.

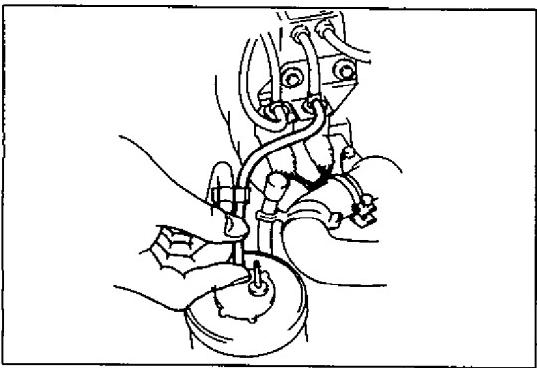
60A50-OB-19-1S



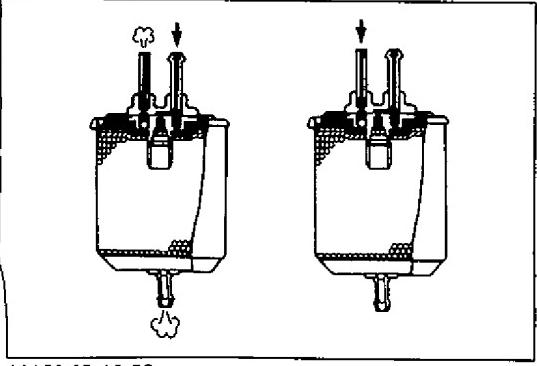
60A50-OB-19-2S



60A50-OB-19-3S



60A50-OB-19-4S



60A50-OB-19-5S

ITEM 4-2**PCV (Positive Crankcase Ventilation) Valve Inspection**

Check crankcase ventilation hoses and PCV hoses for leaks, cracks or clog, and PCV valve for stick or clog. Refer to ON VEHICLE SERVICE of SECTION 6J for PCV valve checking procedure.

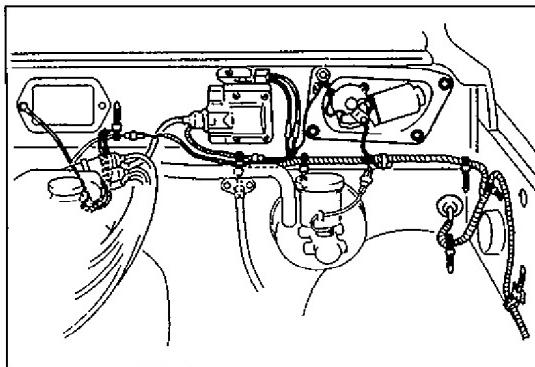
ITEM 4-3**Fuel Vapor Storage System Inspection**

1. Visually inspect hoses for cracks, damage, or excessive bends. Inspect all clamps for damage and proper position.

2. Check canister purge control system for operation, referring to SECTION 6E1.

3. Check charcoal canister for operation and clog, referring to SECTION 6E1.

4. Check 2-way check valve for operation, referring to SECTION 6E1.



60A50-OB-20-1S

ELECTRICAL SYSTEM

ITEM 5-1

Wiring Harness and Connections Inspection

1. Visually inspect all wires in engine compartment for evidence of breakage.
Inspect condition of insulation (cracks). All clips and clamps should have solid connection to wires.
2. Replace any wires in a deteriorated or otherwise defective condition.

Headlights

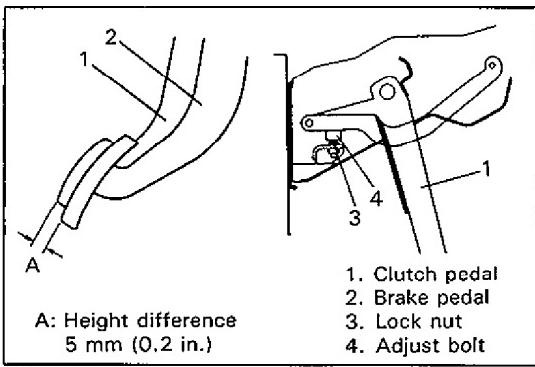
Check vertical and horizontal beam alignment.

Refer to ON VEHICLE SERVICE of SECTION 8.

NOTE:

In countries where statutory regulations define headlight alignments, adjust in conformity with such regulations.

60A50-OB-20-2S



60A50-OB-20-4S

CHASSIS AND BODY

ITEM 6-1

Clutch Pedal Inspection (M/T)

1. Check clutch pedal for height.

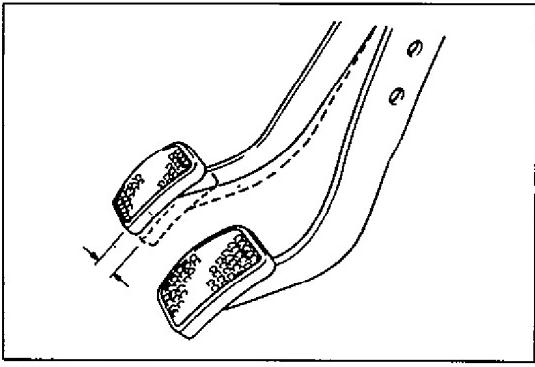
With left-hand steering vehicle, clutch pedal height should exceed brake pedal height by 5 mm (0.2 in.).

With right-hand steering wheel vehicle, clutch pedal height should be the same as brake pedal height.

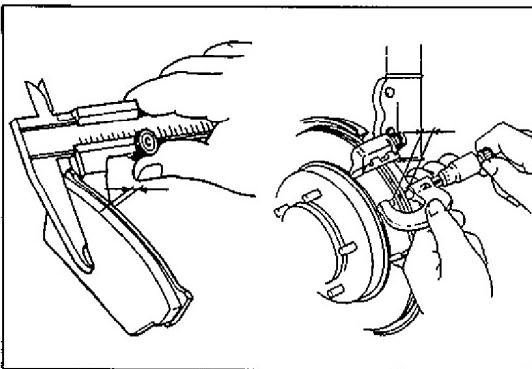
2. Check clutch pedal for free travel.

Clutch pedal free travel: 15—25 mm (0.6—1.1 in.)

Refer to "CLUTCH" section for details.



60A50-OB-20-5S



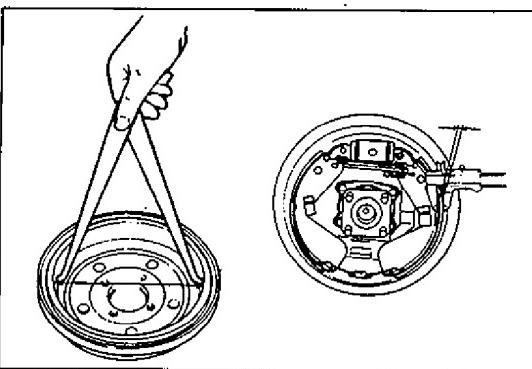
60A50-0B-21-1S

ITEM 6-2

Brake Discs, Pads, Brake Drums and Shoes Inspection

Brake discs and pads

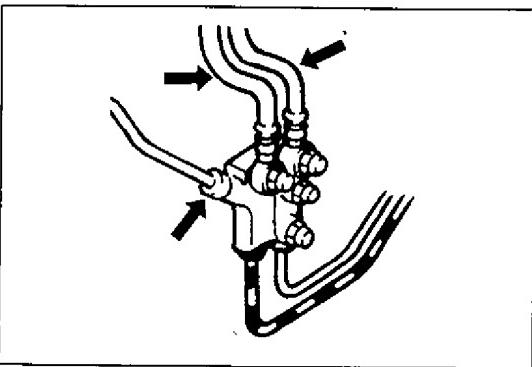
1. Remove wheel and caliper but don't disconnect brake hose from caliper.
2. Check front disc brake pads and discs for excessive wear, damage and deflection. Replace parts as necessary. For details, refer to SECTION 5.
Be sure to torque caliper pin bolts to specification.



60A50-0B-21-2S

Brake drums and shoes

1. Remove wheel and brake drum.
2. Check rear brake drums and brake linings for excessive wear and damage, while wheels and drums are removed. At the same time, check wheel cylinders for leaks. Replace these parts as necessary.
For details, refer to SECTION 5.



60A50-0B-21-4S

ITEM 6-3

Brake Hoses and Pipes Inspection

Check brake hoses and pipes for proper hookup, leaks, cracks, chafing and other damage.

Replace any of these parts as necessary.

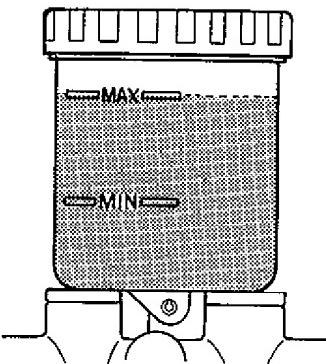
CAUTION:

After replacing any brake pipe or hose, be sure to carry out air purge operation.

ITEM 6-4**Brake Fluid Inspection and Change****Inspection**

1. Check around master cylinder and reservoir for fluid leakage.
If found leaky, correct.

60A50-OB-22-1S



60A50-OB-22-2S

2. Check fluid level.

If fluid level is lower than the minimum level of reservoir, refilling is necessary. Fill reservoir with specified brake fluid.

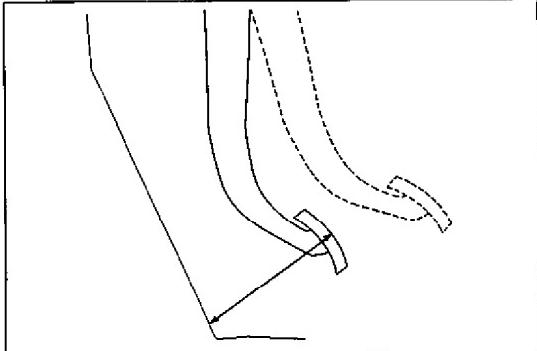
Brake fluid	Specification
	DOT 3 or SAE J1703

For the details, refer to ON VEHICLE SERVICE of SECTION 5.

CAUTION:

Since brake system of this vehicle is factory-filled with glycol-base brake fluid, do not use or mix different type of fluid when refilling system; otherwise serious damage will occur. Do not use old or used brake fluid, or one taken from unsealed container.

60A50-OB-22-4S



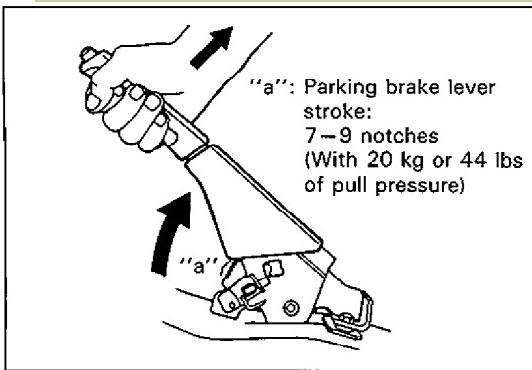
60A50-OB-22-5S

ITEM 6-5**Brake Pedal Inspection**

Check brake pedal travel.

Brake pedal-to-wall clearance: Over 120 mm (4.72 in.)

For checking procedure, refer to PEDAL TRAVEL CHECK of SECTION 5.

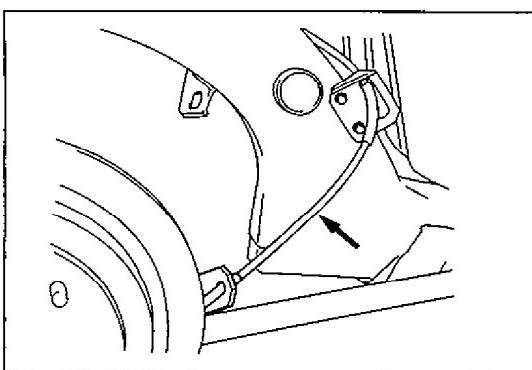


60A50-0B-23-1S

ITEM 6-6**Brake Lever and Cable Inspection****Parking brake lever**

1. Check tooth tip of each notch for damage or wear. If any damage or wear is found, replace parking lever.
2. Check parking brake lever for proper operation and stroke, and adjust it if necessary.

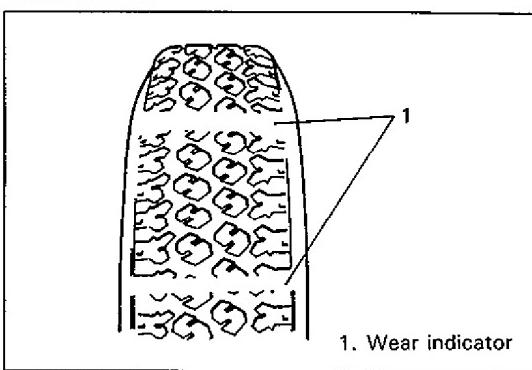
For checking and adjusting procedures, refer to PARKING BRAKE INSPECTION AND ADJUSTMENT of SECTION 5.



60A50-0B-23-2S

Parking brake cable

Inspect brake cable for damage and smooth movement. Replace cable if it is in deteriorated condition.



60A50-0B-23-3S

ITEM 6-7**Tire Inspection and Rotation**

1. Check tires for uneven or excessive wear, or damage. If defective, replace. Refer to SECTION 3 for details.

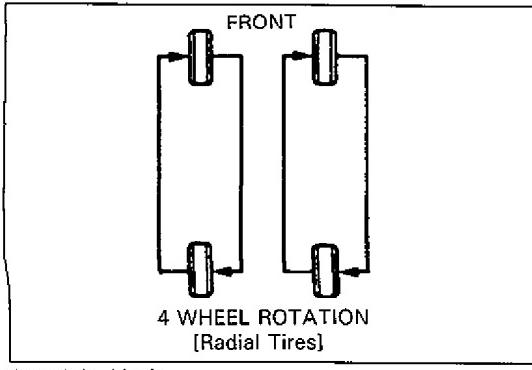
2. Check inflating pressure of each tire and adjust pressure to specification as necessary. Refer to SECTION 3F for details.

NOTE:

- Tire inflation pressure should be checked when tires are cool.
- Specified tire inflation pressure should be found on tire placard or in owner's manual which came with the vehicle.

3. Rotate tires.

For details, refer to SECTION 3F.



60A50-0B-23-5S

ITEM 6-8**Wheel Discs and Free Wheeling Hubs (if equipped) Inspection**
Wheel disc

Inspect each wheel disc for dents, distortion and cracks. A disc in badly damaged condition must be replaced.

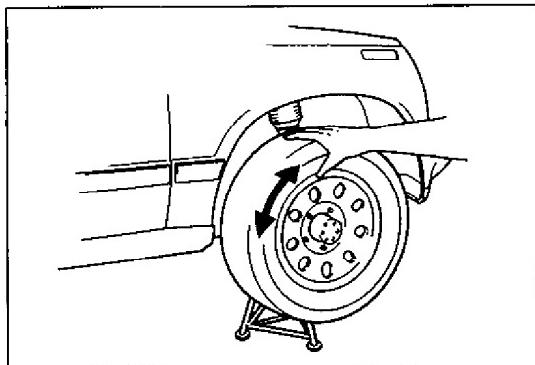
60A50-0B-24-1S

Free wheeling hub

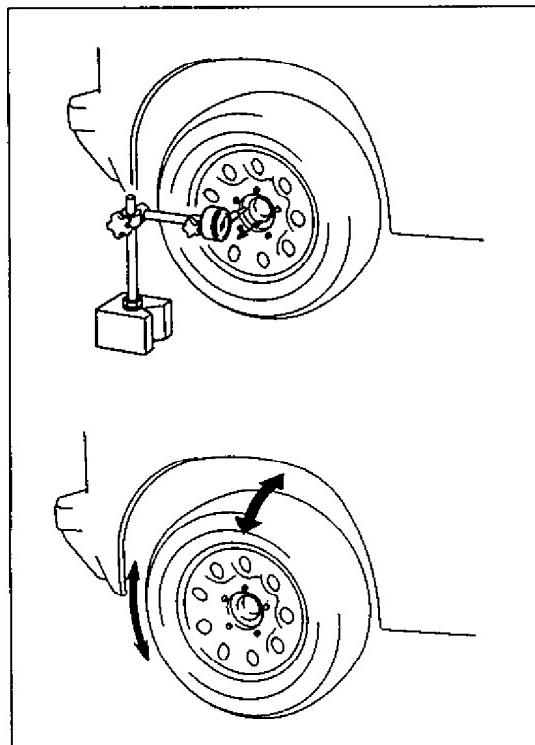
This is applicable to the vehicle equipped with free wheeling hubs.

Check free wheeling hub for proper operation (LOCK and FREE positions). (The same check on both right and left wheels.) For checking procedure, refer to SECTION 3D.

60A50-0B-24-2S



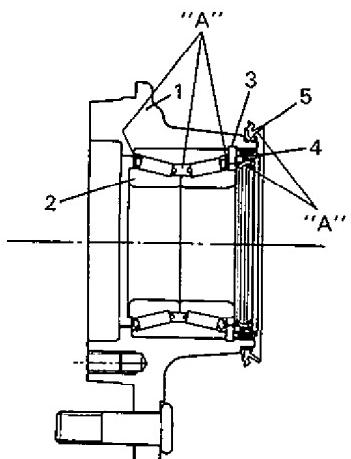
60A50-0B-24-3S

**ITEM 6-9****Wheel Bearing Inspection****Inspection of wheel bearing**

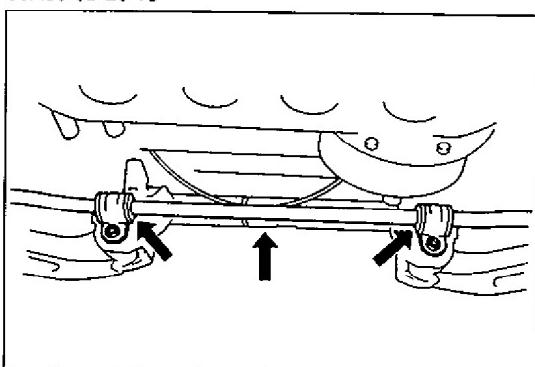
1. Check front wheel bearing for wear, damage, abnormal noise or rattles. For details, refer to FRONT SUSPENSION INSPECTION of SECTION 3D.

2. Check rear wheel bearing for wear, damage abnormal noise or rattles. For details, refer to WHEEL BEARING INSPECTION of SECTION 3E.

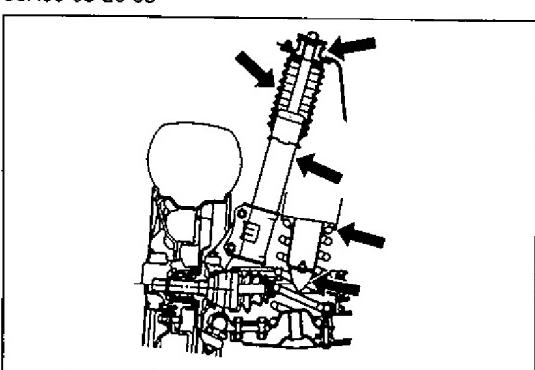
60A50-0B-24-4S



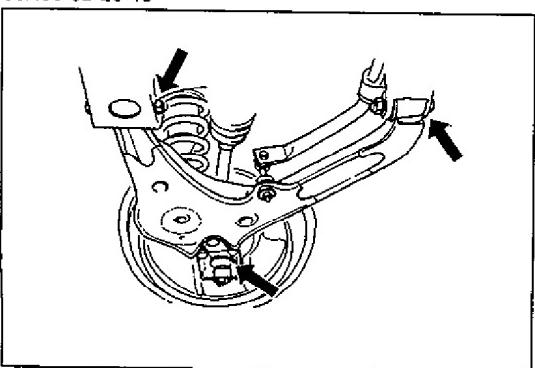
60A50-OB-25-1S



60A50-OB-25-3S



60A50-OB-25-4S



Inspection of front wheel bearing grease

1. Remove wheel hub referring to FRONT WHEEL HUB REMOVAL of SECTION 3D.
2. Check grease around front wheel bearing rollers for deterioration and capacity.

If grease is deteriorated, remove grease thoroughly and apply enough amount of new wheel bearing grease. If grease is found insufficient, add some more.

3. For reinstallation, refer to WHEEL HUB INSTALLATION in SECTION 3D.

NOTE:

- To reinstall bearing lock nut and lock plate, make sure to torque them to specification.
 - Be sure to tighten each bolt and nut to specified torque when reinstalling them.
4. Upon completion of reinstalling all parts, check to make sure that front wheel bearing is not loose and wheel turns smoothly.

ITEM 6-10

Suspension Inspection

Front

1. Check stabilizer bar for damage or deformation.
2. Check bushing for damage, wear or deterioration.

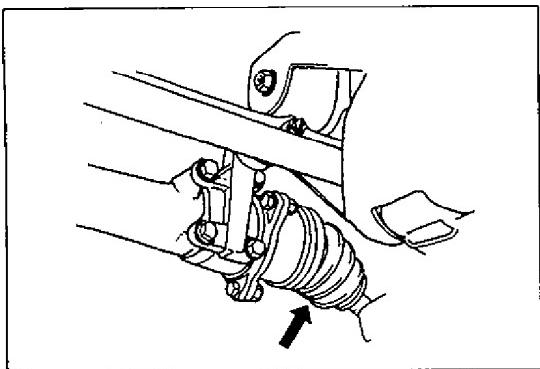
3. Inspect strut for damage, deformation, oil leakage and operation. If strut is found faulty, replace it as an assembly unit, because it can not be disassembled.

Refer to FRONT SUSPENSION INSPECTION of SECTION 3D for operation check.

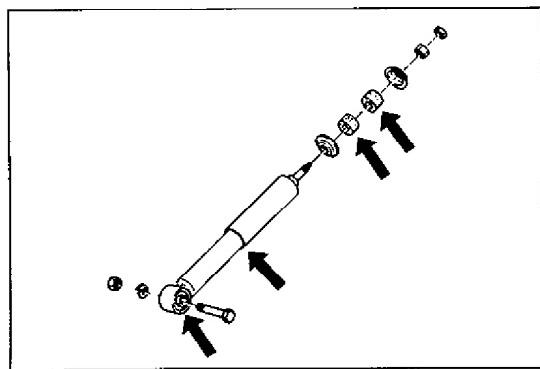
4. Inspect strut boot for damage or crack.
5. Inspect for cracks or deformation in spring seat.
6. Inspect for deterioration of bump stopper.
7. Inspect strut mount for wear, cracks or deformation.

8. Check ball joint stud dust seal (boot) for leaks, detachment, tear or other damage. Check suspension arm bushing for damage, wear or deterioration.

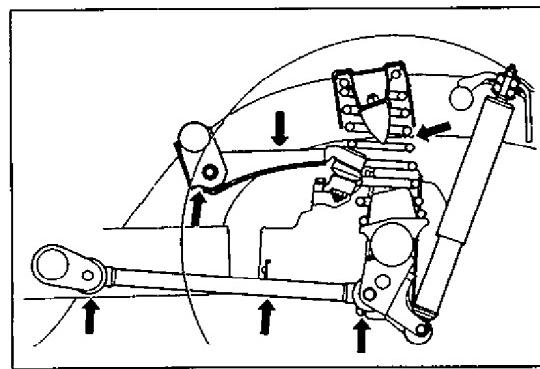
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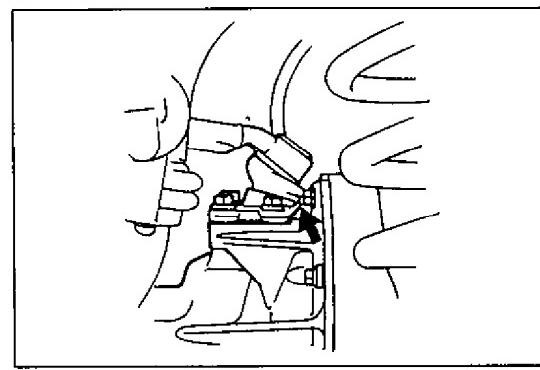
60A50-0B-26-1S



60A50-0B-26-2S



60A50-0B-26-3S



60A50-0B-26-4S

9. Check drive axle boots (wheel side and differential side) for leaks, detachment, tear or other damage.
Replace boot as necessary.

Rear

10. Check shock absorber for damage, deformation, oil leakage and operation.
11. Check bushings for wear and damage.

12. Check oil spring, trailing rod and upper arm for deformation and damage.
13. Check trailing rod and upper arm bushings for wear, damage and deterioration.

14. Check joint boot for breakage and damage.

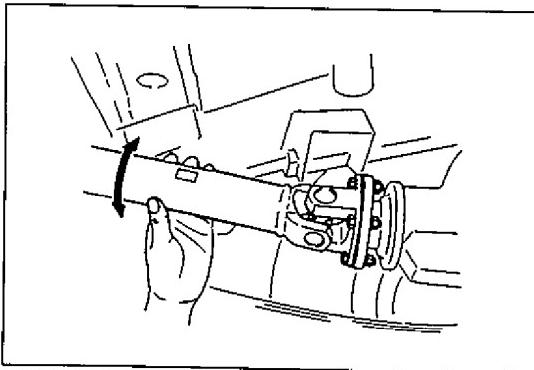
15. Check other suspension parts for damage, loose or missing parts; also for parts showing signs of wear or lack of lubrication.
Replace any parts found defective in step 1 to 15.

16. Check suspension bolts and nuts for tightness and retighten them as necessary.
Repair or replace defective parts, if any.

NOTE:

For details of check points, refer to tables of **TIGHTENING TORQUE SPECIFICATION** in SECTION 3D and 3E.

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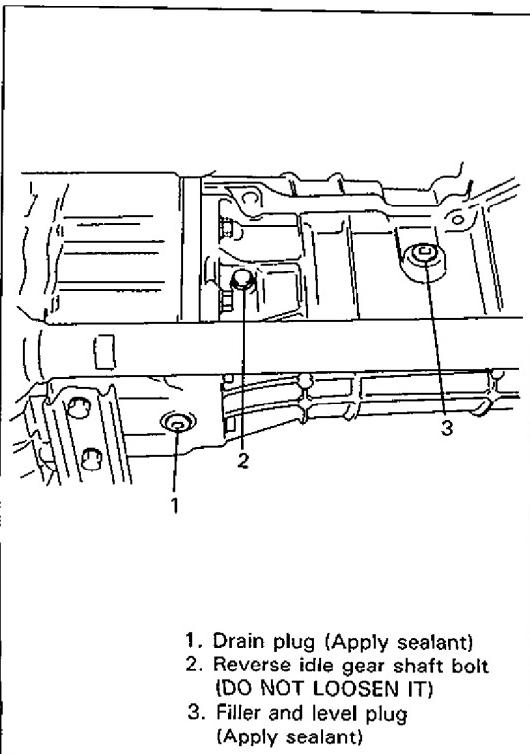


60A50-OB-27-2S

ITEM 6-11**Propeller Shafts Inspection**

1. Check universal joint and spline of propeller shaft for rattle. If rattle is found, replace defective part with a new one.
2. Check propeller shaft (front & rear) flange yoke bolts for tightness, and retighten them as necessary:
Refer to SECTION 4B for tightening torque.

60A50-OB-27-3S



60A50-OB-27-4S

ITEM 6-12 (Manual transmission)**Transmission Oil Inspection and Change Inspection**

1. Inspect transmission case for evidence of oil leakage.
Repair leaky point if any.
2. Make sure that vehicle is placed level for oil level check.

3. Remove level plug of transmission.

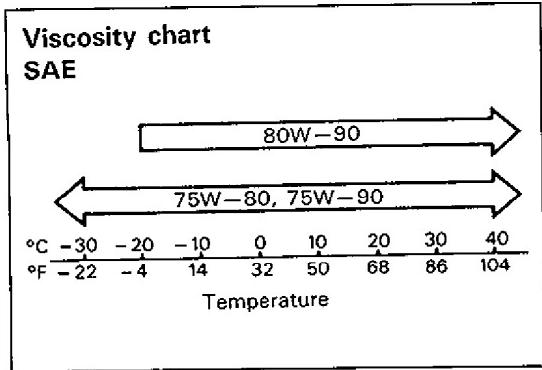
4. Check oil level.

Oil level can be checked roughly by means of level plug hole. That is, if oil flows out of level plug hole or if oil level is found up to hole when level plug is removed, oil is properly filled.

If oil is found insufficient, pour specified amount of specified oil.

5. Tighten level plug to specified torque.

Refer to SECTION 7A for tightening torque.



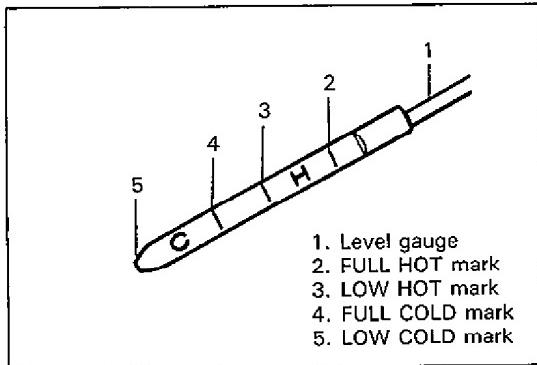
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Change

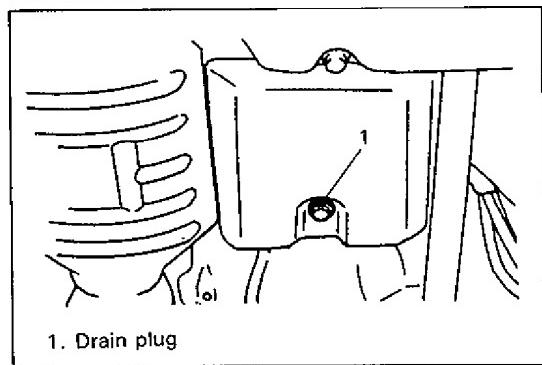
1. Place vehicle level and drain oil by removing drain plug.
2. Tighten drain plug to specified torque. Pour specified amount of specified oil and tighten filler plug to specified torque.

It is highly recommended to use SAE 75W-90 gear oil.

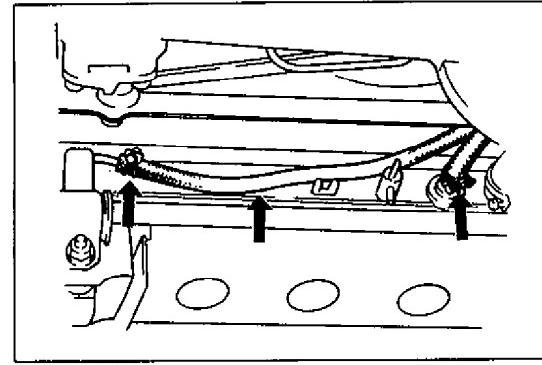
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60A50-0B-28-3S



60A50-0B-28-4S



60A50-0B-28-5S

ITEM 6-13**Automatic Transmission****Fluid level inspection**

1. Inspect transmission case for evidence of fluid leakage.
Repair leaky point, if any.
2. Make sure that vehicle is placed level for fluid level check.

3. Check fluid level.

For fluid level checking procedure, refer to ON VEHICLE SERVICE in SECTION 7B1 and be sure to perform it under specified conditions. If fluid level is low, replenish specified fluid.

Fluid change

1. Perform steps 1 and 2 of above Fluid Level Inspection.
2. Change fluid. For its procedure, refer to ON VEHICLE SERVICE in SECTION 7B1.

CAUTION:

Use of specified fluid is absolutely necessary.

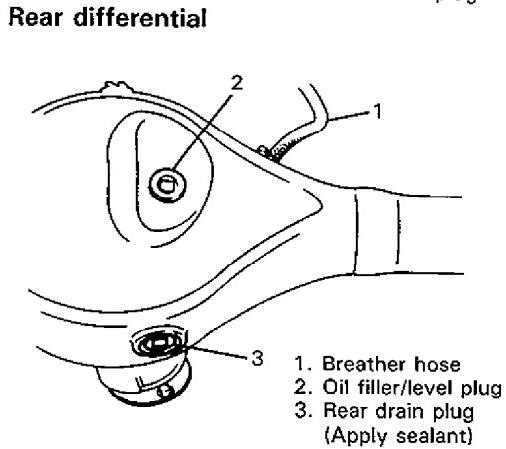
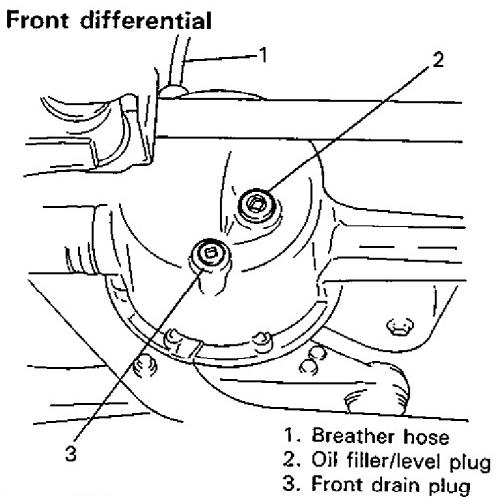
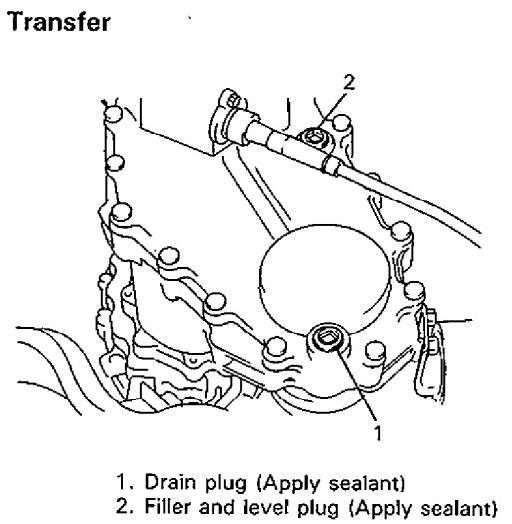
Fluid cooler hose change

Replace inlet and outlet hoses of cooler hose and their clamps. For replacement procedure, refer to ON VEHICLE SERVICE in SECTION 7B1.

ITEM 6-14**Transfer and Differential Oil Inspection and Change
Inspection**

1. Check transfer case and differential for evidence of oil leakage.
Repair leaky point if any.
2. Make sure that vehicle is placed level for oil level check.

60A50-OB-29-1S



3. Remove level plug of transfer and differentials (front and rear) and check oil level.

Oil level can be checked roughly by means of level plug hole. That is, if oil flows out of level plug hole or if oil level is found up to hole when level plug is removed, oil is properly filled.

If oil is found insufficient, pour specified amount of specified oil.

CAUTION:

Hypoid gear oil must be used for differential.

4. Tighten level plug to specified torque.

Refer to SECTION 7A or SECTION 7E for tightening torque.

60A50-OB-29-2S

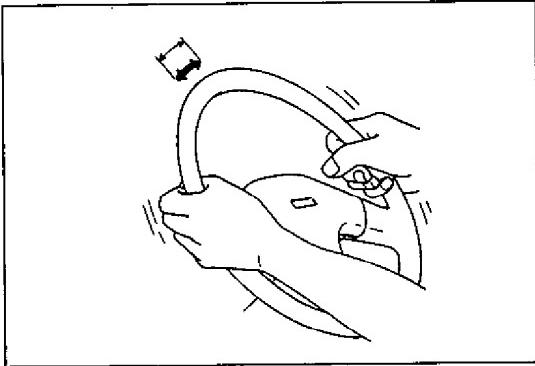
Change

1. Place vehicle level and drain oil by removing drain plug.
2. Tighten drain plug to specified torque.
3. Pour specified amount of specified oil, referring to viscosity chart in item 6-12 and tighten filler plug to specified torque. For details, refer to SECTION 7A or 7E.

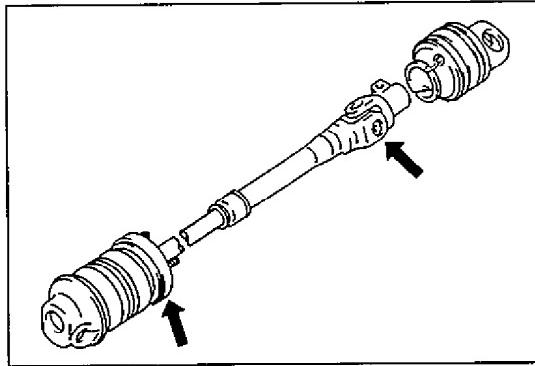
CAUTION:

Hypoid gear oil must be used for differential.

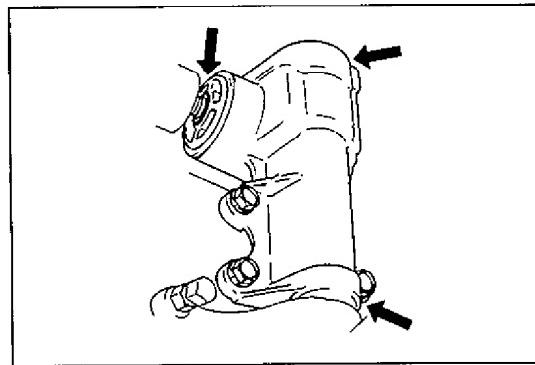
60A50-0B-30-1S



60A50-0B-30-2S



60A50-0B-30-3S



60A50-0B-30-4S

ITEM 6-15**Steering System Inspection**

1. Check steering wheel for play and rattle, holding vehicle in straight forward condition on the ground.

Steering wheel play: 10–30 mm (0.4–1.2 in.)

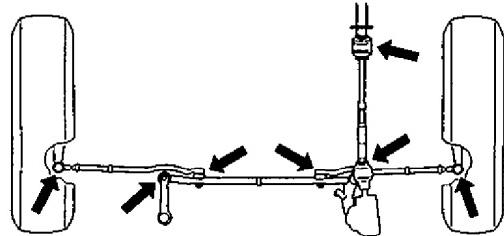
2. Check universal joints of steering shaft for rattle and damage. If rattle or damage is found, replace defective part with a new one.

3. Inspect steering gear box for evidence of oil leakage. If leakage is found, check oil level in gear box.

4. Check bolts and nuts for tightness and retighten them as necessary. Repair or replace defective parts, if any. Refer to table of TIGHTENING TORQUE SPECIFICATION of SECTION 3B2 and 3C2 for particular check points.

NOTE:

For details of the above steps 1 to 4, refer to SECTION 3B2 and 3C2.

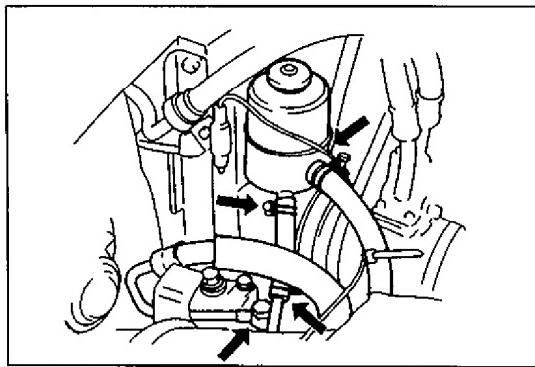


60A50-0B-31-1S

5. Check boots of steering linkage for damage (leaks, detachment, tear, etc.). If damage is found, replace defective boot with new one.
6. Check wheel alignment.

NOTE:

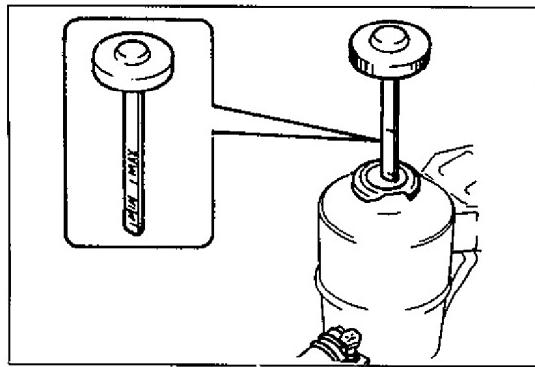
For details of wheel alignment, refer to WHEEL ALIGNMENT of SECTION 3A.



60A50-0B-31-2S

ITEM 6-16**Power Steering (P/S) System Inspection (if equipped)**

1. Visually check power steering system for fluid leakage and hose for damage and deterioration.
Repair or replace defective parts, if any.

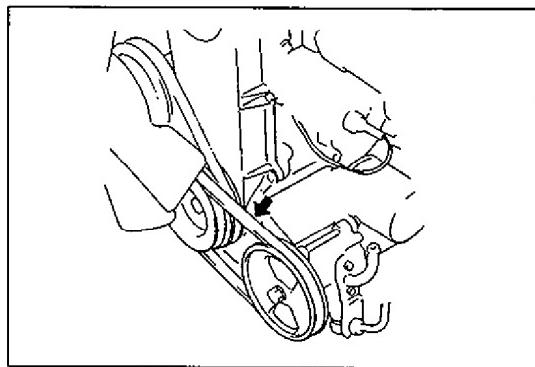


60A50-0B-31-3S

2. Remove oil tank cap and check fluid level indicated on level gauge, which should be between MAX and MIN marks. If it is lower than MIN, fill fluid up to MAX mark.

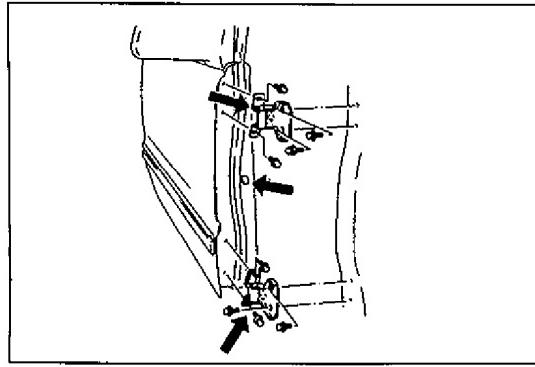
NOTE:

- Be sure to use DEXRON II for P/S fluid.
- Fluid level should be checked when fluid is cool.



60A50-0B-31-4S

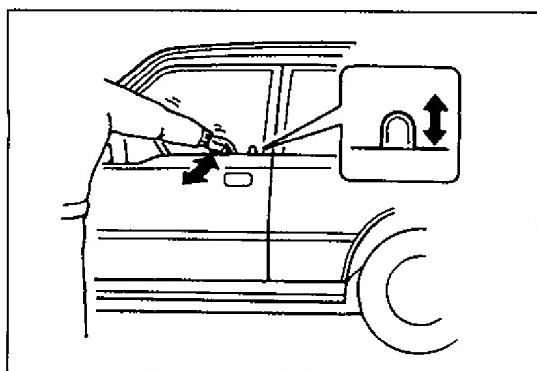
3. Visually check pump drive belt for cracks and wear.
4. Check belt for tension, referring to item 1-1.
If necessary, have belt adjusted or replaced.



60A50-0B-31-5S

ITEM 6-17.**Door Hinges Lubrication**

Lubricate door hinges for smooth operation.



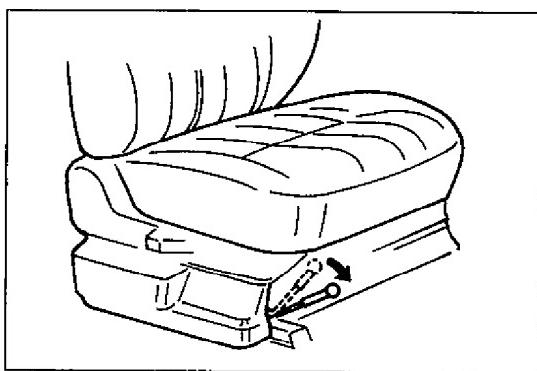
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FINAL INSPECTION

BODY PARTS OPERATION

Doors

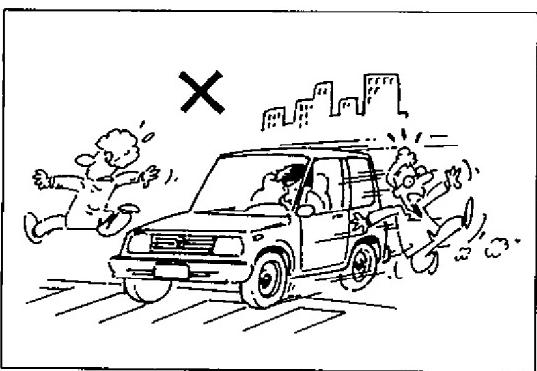
Check that each door opens and closes smoothly and locks securely when closed.



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Seats

Check that seat locks securely.



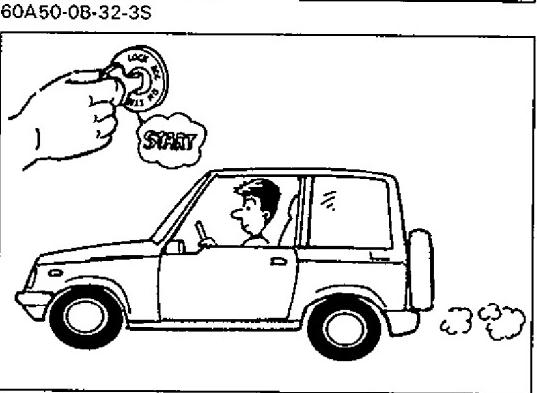
60A50-0B-32-3S

ROAD TEST

Carry out road test in safe place.

WARNING:

When carrying out following road tests, select a safe place where no man or no running car is seen so as to prevent any accident.



60A50-0B-32-4S

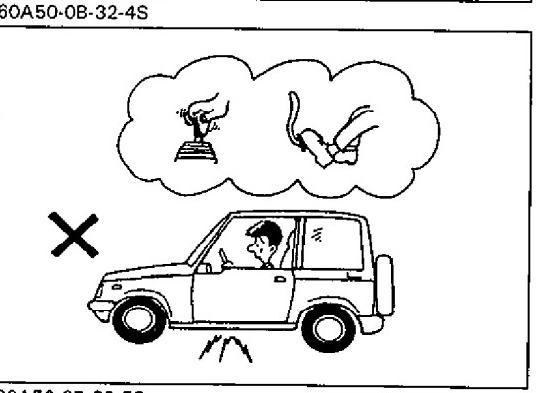
Engine Start

Check engine start for readiness.

Clutch (For Manual transmission)

Check for the following.

- Clutch is completely released when depressing clutch pedal,
- No slipping clutch occurs when releasing pedal and accelerating,
- Clutch itself is free from any abnormal condition.



60A50-0B-32-5S

Gearshift or Selector Lever (Transmission)

Check gear shift or selector lever for smooth shifting to all positions and for good performance of transmission in any position.

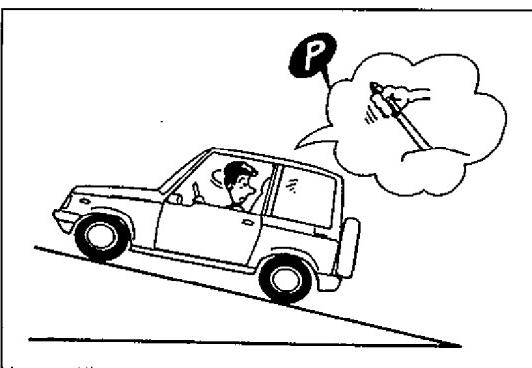


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Brake**[Foot brake]**

Check the following when depressing brake pedal while driving;

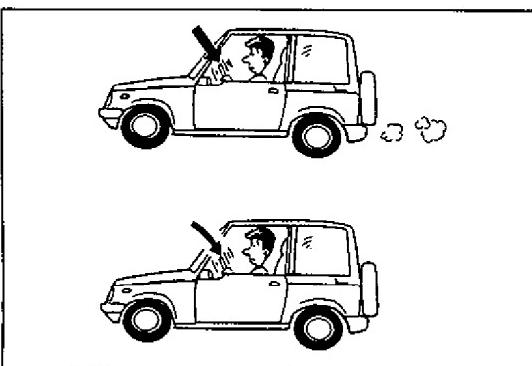
- that brake works properly,
- that it is free from noise,
- and that braking force is applied equally on all wheels.



60A50-0B-33-2S

[Parking brake]

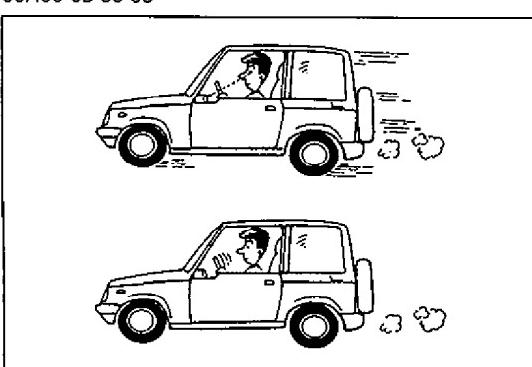
Check to ensure that parking brake is fully effective when vehicle is stopped on a slope on brake lever is pulled all the way.



60A50-0B-33-3S

Steering

- Check to ensure that steering wheel is free from instability, or abnormally heavy feeling while driving.
- Check that vehicle does not wander or pull to one side.



60A50-0B-33-4S

Engine

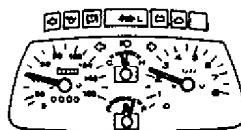
- Check that engine responds readily at all speeds.
- Check that engine is free from abnormal noise and abnormal vibration.



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Body, Wheels and Power Transmitting System

Check that body, wheels and power transmitting system are free from abnormal noise and abnormal vibration or any other abnormal condition.



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Meters and Gauge

Check that speedometer, odometer, fuel meter, temperature gauge, etc. are operating accurately.

Lights

Check that all lights operate properly.



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Seat Belt

Inspect belt system, including webbing, buckles, latch plates, retractors and anchors.

Check that seat belt is securely locked.

WARNING:

For this test, select a safe place without any running vehicle so as to prevent any accident. And again make sure that no man or no other vehicle is seen in front or behind and use great care to the surroundings when carrying out the test.

OWNER INSPECTIONS AND SERVICES

Listed below are items which should be checked and serviced by either the owner himself or a qualified technician daily or periodically to help ensure safety and dependability of each vehicle. Should any problem occur, contact nearby dealer or a qualified technician for proper service advice. For the safety of the driver himself and others, be sure to inspect any safety-related parts that could have been damaged in any accident and take corrective measures for whatever in need of repair before using vehicle again.

BEFORE OPERATING VEHICLE

[OUTSIDE VEHICLE]

Fluid Leak Check

Check for fuel, coolant, oil, or other fluid leakage by looking at surface beneath vehicle after it has been parked for a while. Water dripping from air conditioning system after use is normal. If gasoline fume of fluid is noted at any time, investigate its cause and correct it at once.

Door Operation

Check that all doors operate smoothly, and that all doors close and all latches lock securely.

Tire, Wheel and Wheel Nut Inspection

- Check pressure as shown on tire placard (including spare tire). Pressure should be checked when tires are "cold".
- Check tire for cuts, damage or excessive wear.
- Check wheel nuts for looseness or for missing nuts. If necessary, tighten them.

Battery Electrolyte Level Check

Check that electrolyte level of all battery cells is between upper and lower level lines on the case.

[INSIDE VEHICLE]

Seat Adjuster Operation

- Check that seat locks properly and securely.

Glass, Mirror, Light and/or Reflector Condition

Check each glass, mirror, light and reflector for breakage, scratch, dirt or any other damage which could reduce driver's view or visibility or cause injury. Replace, clean or repair promptly, if necessary.

Rear View Mirror and Sun Visor Operation

Check that friction joints hold mirrors and sun visors in place.

Seat Belts Condition and Operation

Check belt system including webbing, buckles, latch plate, retractors, guide loops, and anchors for proper operation, damage and/or wear.

Light Operation

Check license plate light, headlights, small lights, taillights, brake lights, turn signals, back-up lights, instrument panel lights and interior light, hazard warning flashers and other lights. Have headlight aim checked at once if beams seem improperly aimed.

Clutch Pedal Free Travel Check

- Check free travel and adjust as necessary.
- Check pedal for smooth operation.

Accelerator Pedal Operation

Check that pedal operates smoothly without getting caught or interfered by any other part.

Exhaust System Check

Check for leakage, cracks or loose supports.

Brake Pedal Check

- Check pedals for smooth operation.
- Check pedal travel (pedal-to-wall clearance).
For checking procedure, refer to PEDAL TRAVEL CHECK of SECTION 5.
- Check brake booster function.

Parking Brake Lever Travel Check

Check that lever has proper travel.

Brake Master Cylinder Fluid Level Check

Check reservoir tank fluid level in accordance with Owner's Manual and keep at proper level.

NOTE:

A large loss in this system may indicate a problem. Have it inspected and repaired at once.

Engine Oil Level Check

Check engine oil level indicated on dipstick with engine turned off and add if necessary.

See Owner's Manual.

NOTE:

A large loss in this system may indicate a problem. Have it inspected and repaired at once.

Engine Coolant Level and Condition

When engine is cool, check coolant level in reservoir tank and add if necessary.

Inspect coolant and replace if dirty or rusty.

A normal coolant level should be between "FULL" and "LOW" marks on reservoir tank.

See Owner's Manual.

NOTE:

A large loss in this system may indicate a problem. Have it inspected and repaired at once.

Engine Drive Belt(s) Inspection

Inspect all belts for cracks, fraying and wear.

Adjust or replace as needed.

Windshield Washer Fluid Level Check

Check washer fluid level in tank and add if necessary.

WHILE OPERATING VEHICLE**Horn Operation**

Check to make sure that horn works when its button is pushed at its any part.

Windshield Wiper and Washer Operation

Check wipers and washer for proper operation. Also check spray direction of washer fluid.

Check wiper blades for wear or cracks whenever they fail to wipe clean. If necessary, replace.

Windshield Defroster

Periodically check that air comes out from defroster outlet when operating heater or air conditioner (if equipped).

Set fan switch lever to "HI" position for this check.

Steering System Operation

Be alert for any changes in steering action. An inspection or service is needed when steering wheel is harder to turn or has too much free play, or if it makes strange sounds when turned.

Brake System Operation

Be alert to abnormal noise, increase in brake pedal travel or repeated pull to one side when braking. When any of such conditions is noted, check brake system. If brake warning light stay on or keeps flashing, there may be some trouble in brake system.

Also, test parking brake by pulling parking brake lever.

Exhaust System Operation

Be alert for any changes in the sound of exhaust system or any smell of fumes. These are signs that indicate possible leakage. Have it checked and/or repaired at once.

Tire and Wheel Operation

Be alert to vibration of steering wheel or seat at normal highway speeds. This may mean a wheel balance is needed. Also, a pull right or left on a straight, level road may show the need for a tire pressure adjustment or wheel alignment.

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RECOMMENDED FLUIDS AND LUBRICANTS

Engine oil	SE,SF or SG, SAE 10W-30 (Refer to p. OB-11.)
Engine coolant (Ethylene glycol base coolant)	GOLDEN CRUISER NA1200 "Antifreeze/Anticorrosion coolant"
Brake fluid	DOT 3 or SAE J1703
Manual transmission oil	API GL-4, SAE 75W-90 (Refer to p. OB-28.)
Transfer oil	
Differential oil (front & rear)	API GL-5, SAE 75W-90 Hypoid gear oil (Refer to p. OB-28)
Automatic transmission fluid and Power steering fluid	Automatic transmission fluid DEXRON-II
Clutch linkage pivot points	Water resistance chassis grease (SUZUKI SUPER GREASE A 99000-25010)
Gear shift control lever and shaft	Water resistance chassis grease (SUZUKI SUPER GREASE A 99000-25010)
Door hinges	Engine oil
Hood latch assembly	Engine oil
Key lock cylinder	Spray lubricant

60A50-OB-37-2S

SECTION 1A

HEATER AND VENTILATION

NOTE:

For the descriptions (items) not found in this section, refer to SECTION 1A of the Service Manual mentioned in FOREWORD of this manual.

60A50-1A-1-1S

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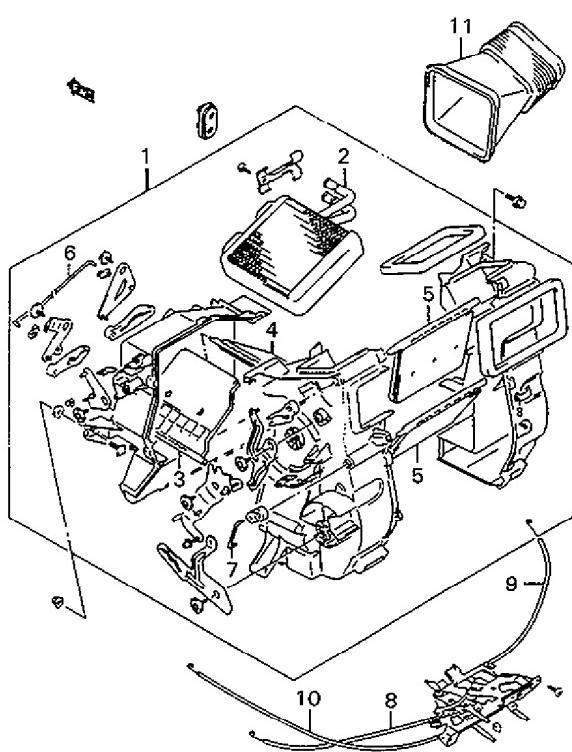
GENERAL DESCRIPTION	1A-1
SERVICING	1A-2
Control Cables	1A-2
BODY VENTILATION	1A-4

60A50-1A-1-2S

GENERAL DESCRIPTION

HEATER UNIT

Heater unit consists of following parts.

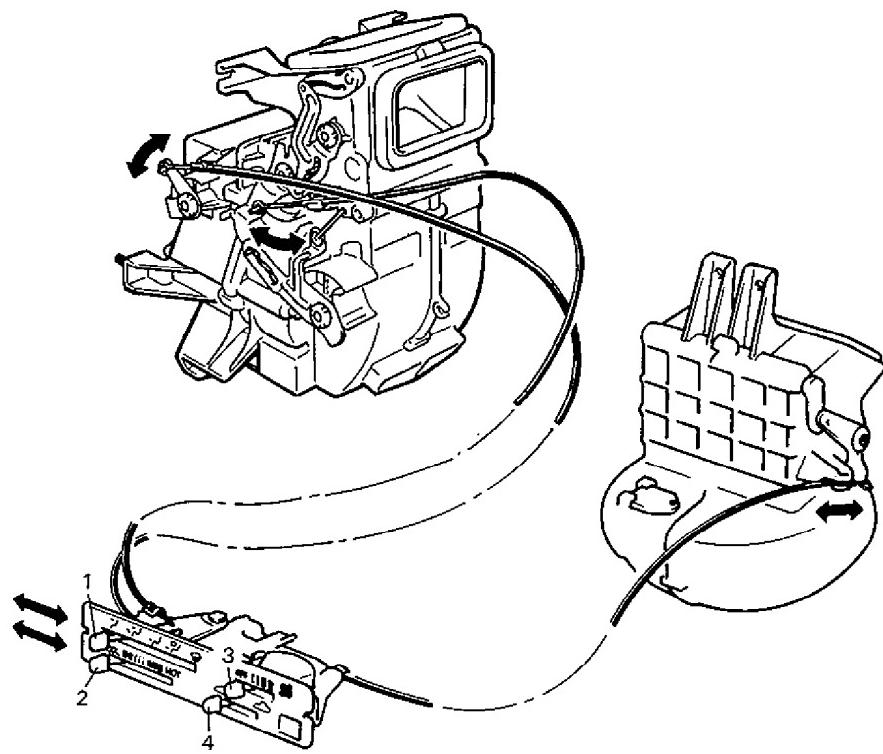


- 1. Heater ass'y
- 2. Radiator core
- 3. Damper
- 4. Damper
- 5. Damper
- 6. Shaft
- 7. Shaft
- 8. Air (Mode) control cable
- 9. Fresh air (Fresh-circle) control cable
- 10. Heater (Hot-cool) control cable
- 11. Heater duct (without A/C)

60A50-1A-1-3S

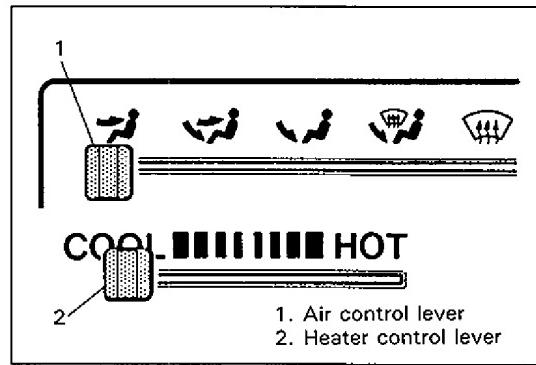
SERVICING

CONTROL CABLES



1. Air control lever
2. Heater control lever
3. Blower speed control lever
4. Fresh air control lever

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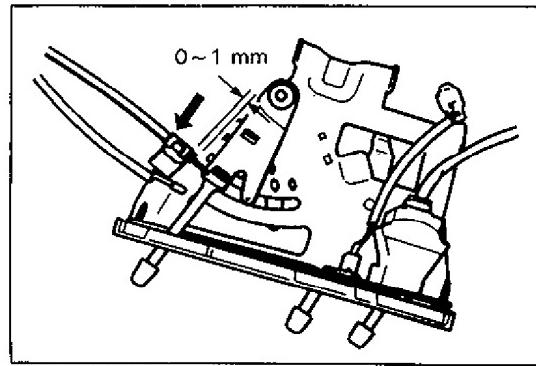


ADJUSTMENT

A. Air Control Cable

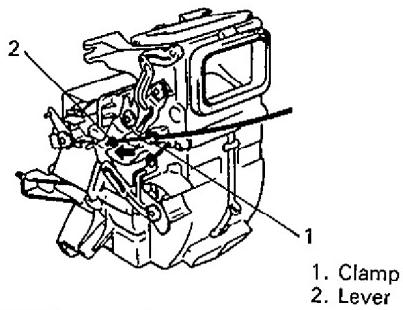
1. Set air control lever to "FACE" position.

60A50-1A-2-4S



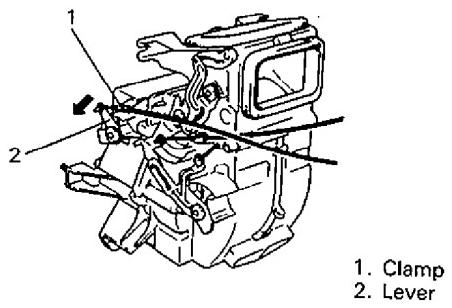
2. At its control lever-side, clamp outer cable with its end 0 to 1 mm projected from clamp.

60A50-1A-2-5S



60A50-1A-3-1S

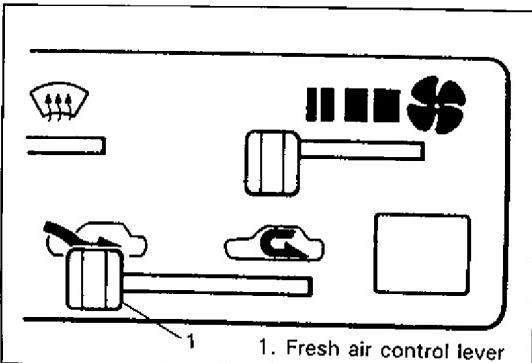
3. As shown in figure, push lever on box fully in arrow direction and fix cable with clamp in position.



60A50-1A-3-2S

B. Heater Control (COOL-HOT Selector) Cable

1. Set control lever to COOL position.
2. Push lever on box fully in arrow direction and fix cable with clamp in position, as shown in figure.

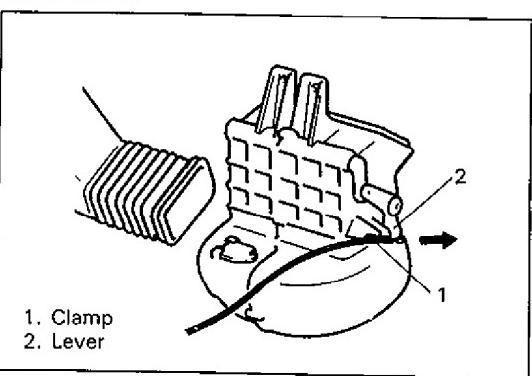


60A50-1A-3-3S

C. Fresh Air Control (FRESH-CIRC Selector) Cable

1. Set control lever to FRESH position.

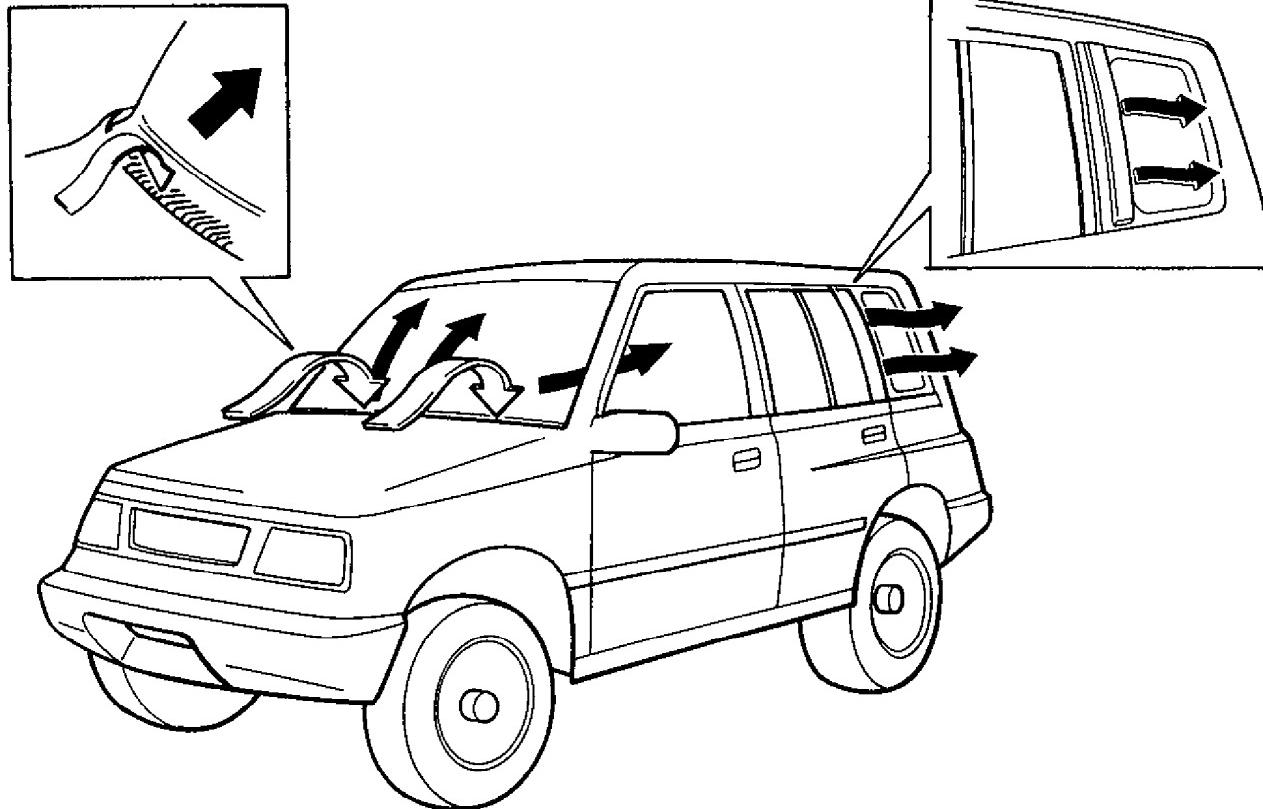
2. Push lever on motor case fully in arrow direction and fix cable with clamp in position as shown in figure.



60A50-1A-3-4S

BODY VENTILATION

When fresh air control lever is at FRESH position, air is drawn into the interior from cowl top panel and drawn out from the ventilator outlet provided at body outer panel (both right and left side).



60A50-1A-4-1S

SECTION 2

BUMPERS AND SHEET METAL

CONTENTS

FRONT BUMPER	2-1
REAR BUMPER	2-2
FRONT FENDER	2-3

60A50-2-1-1S

NOTE:

Fasteners are important attaching parts in that they could affect the performance of vital components and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary.

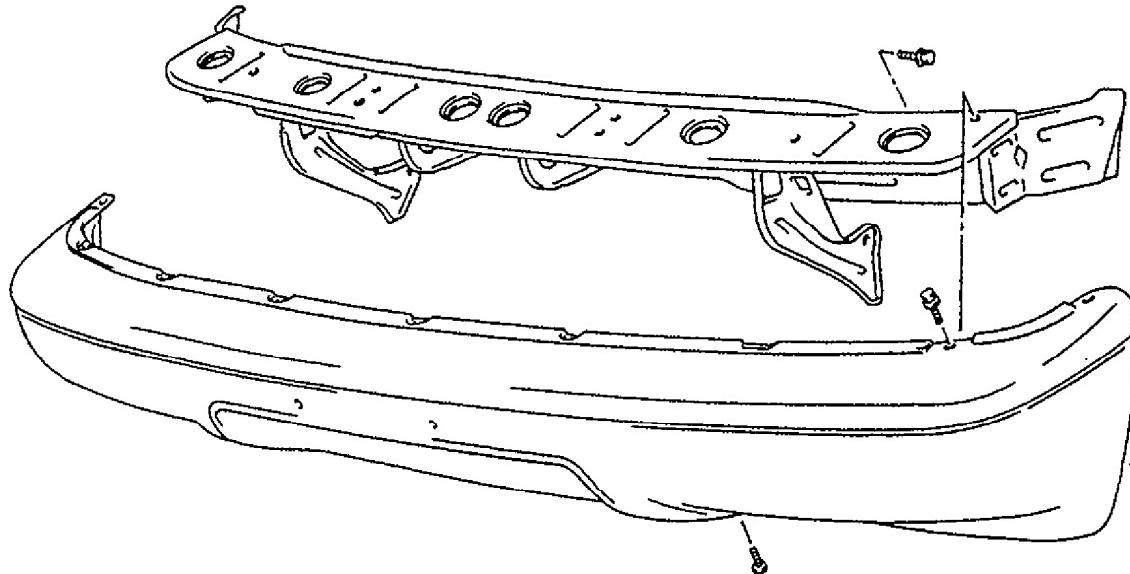
Do not use a replacement parts of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of these parts.

60A50-2-1-2S

FRONT BUMPER

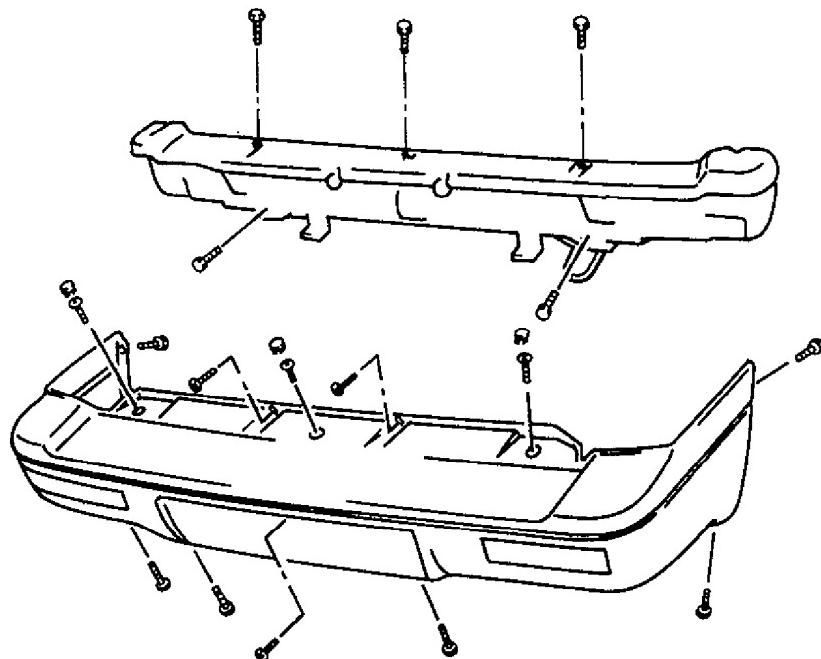
NOTE:

If vehicle is equipped with head lamp washer, remove head lamp washer cover, front bumper, washer hose, nozzle and reinforcement in that order.
(Refer to p. 8-22)

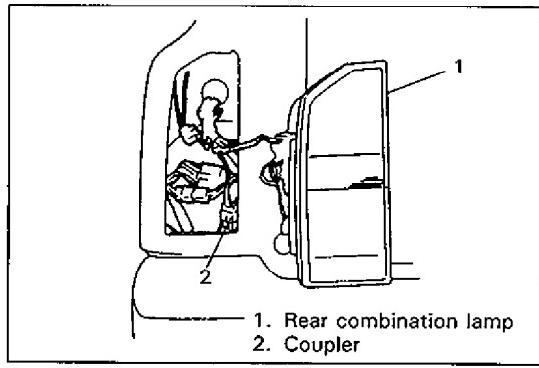


60A50-2-1-3S

REAR BUMPER



60A50-2-2-1S



60A50-2-2-4S

NOTE:

When removing rear bumper with rear fog lamp or rear combination lamp, disconnect coupler shown figure.

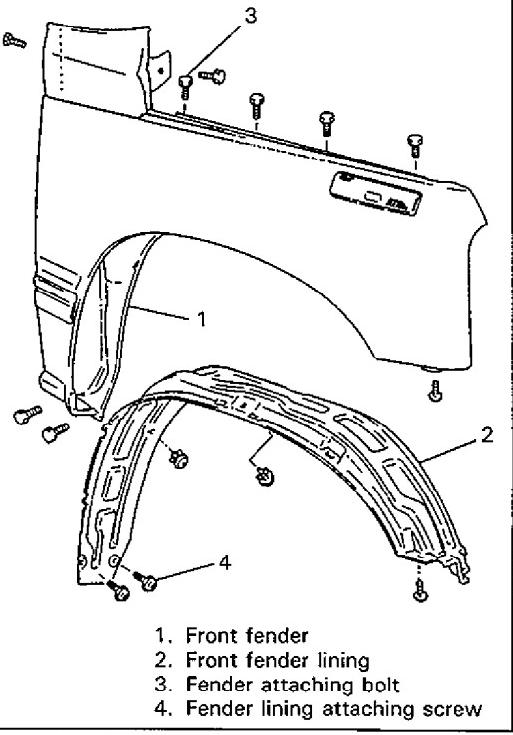
FRONT FENDER

REMOVAL

1. Remove front bumper.
2. Disconnect connector of side turn signal (or side marker) lamp.
3. Remove front fender lining.
4. Remove front fender.

INSTALLATION

1. Reverse removal procedure to install front fender.



60A50-2-3-1S

SECTION 3B3

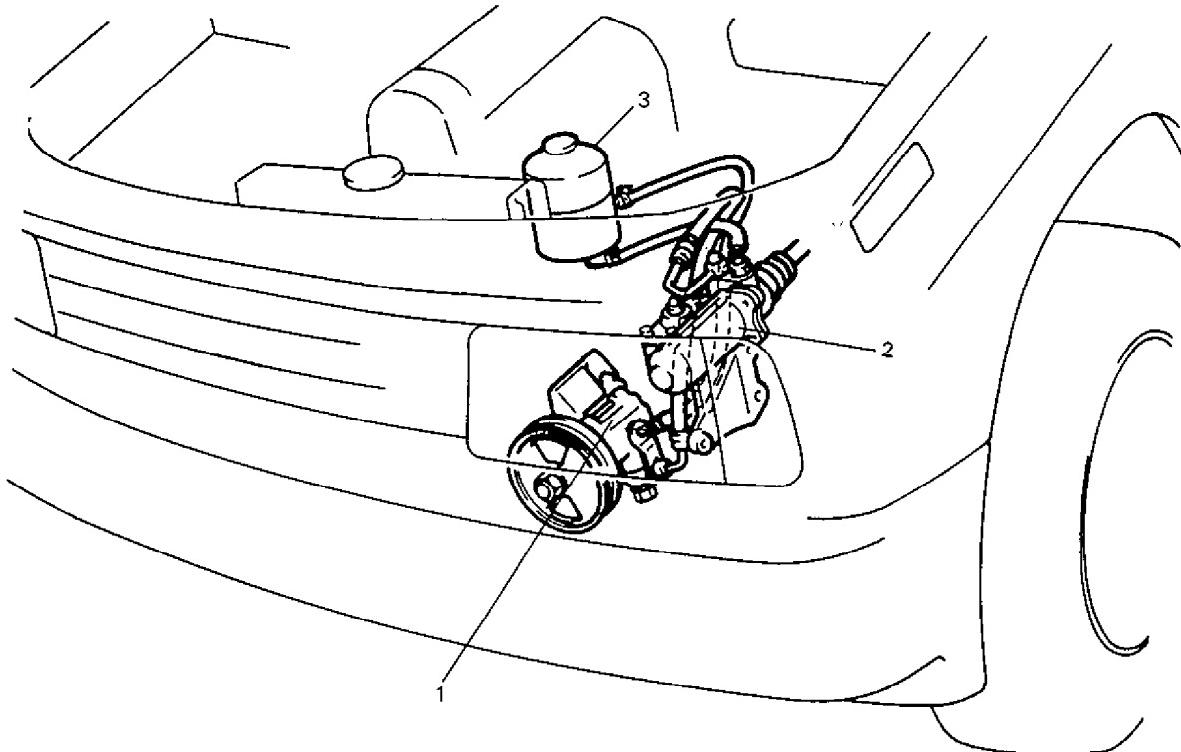
POWER STEERING (P/S) SYSTEM (OPTIONAL)

NOTE:

For the descriptions (items) not found in this section of this manual, refer to SECTION 3B3 of the Service Manual mentioned in FOREWORD of this manual.

GENERAL DESCRIPTION

Power steering pump, power steering gear box and oil tank of the power steering (P/S) system are installed as shown in the figure below.



1. Power steering pump
2. Power steering gear box
3. Oil tank

SECTION 3C2

STEERING WHEEL, COLUMN AND SHAFT

NOTE:

For the descriptions (items) not found in this section of this manual, refer to SECTION 3C2 of the Service Manual mentioned in FOREWORD of this manual.

60A50-3C2-1-1S

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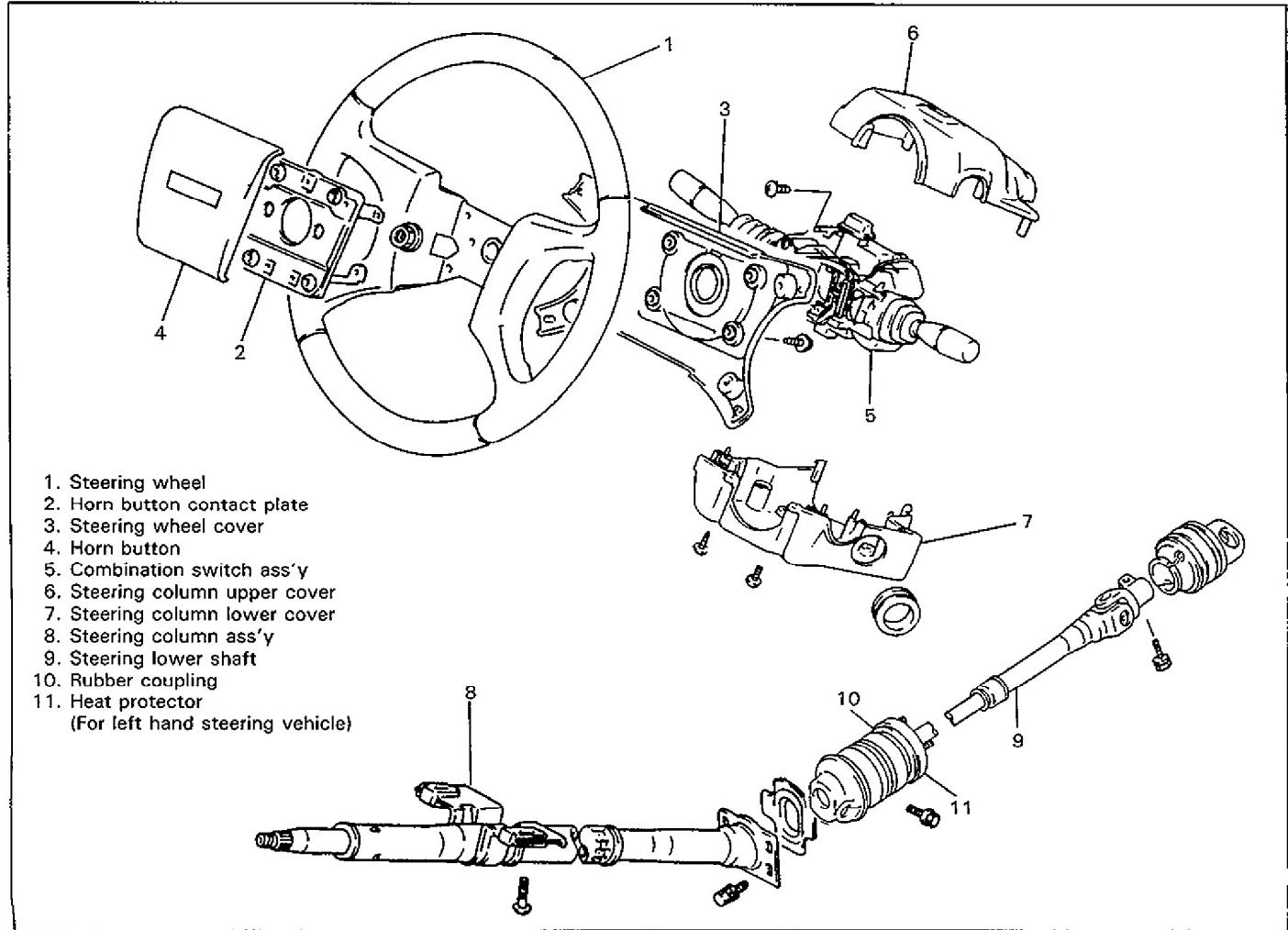
GENERAL DESCRIPTION 3C2-1

CHECKING STEERING COLUMN FOR ACCIDENT DAMAGE 3C2-2

60A50-3C2-1-2S

GENERAL DESCRIPTION

The steering lower shaft used for this model is a collapsible type. It uses a rubber coupling which cannot be disassembled.



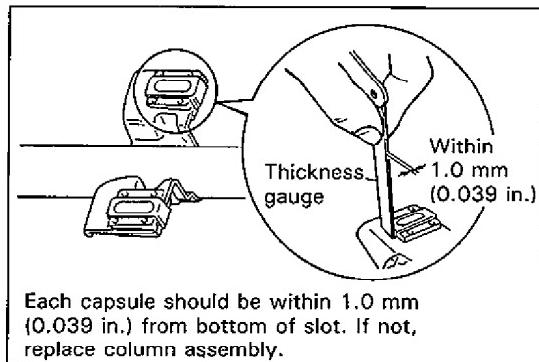
60A50-3C2-1-3S

CHECKING STEERING COLUMN FOR ACCIDENT DAMAGE

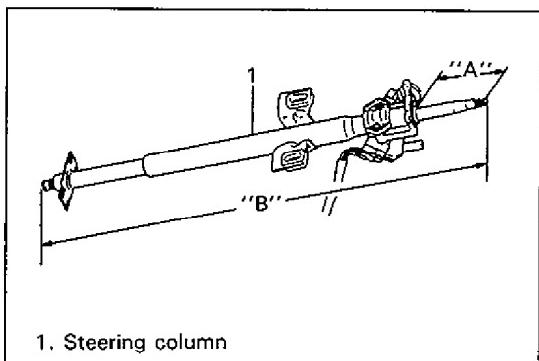
NOTE:

Vehicles involved in accidents resulting in body damage or where steering column has been impacted may also have a damaged or misaligned steering column.

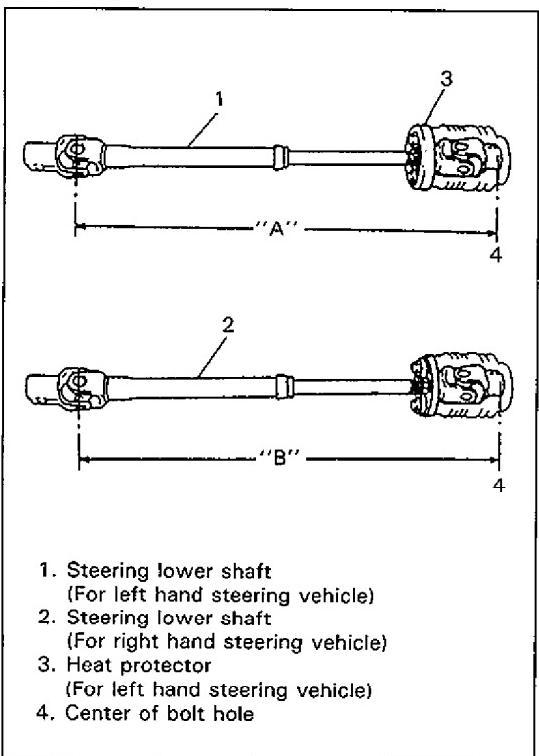
60A50-3C2-2-1S



60A50-3C2-2-2S



60A50-3C2-2-3S



60A50-3C2-2-4S

CHECKING PROCEDURE

- Check capsules on steering column bracket; both should be within 1.0 mm (0.039 in) from bottom of slots. If not, steering column assembly should be replaced. Use thickness gauge for convenience.

- Take measurement "A" as shown. If it is shorter than specified length, replace column assembly with new one.

Specified length

"A": 99 mm (3.90 in.)

"B": 778 mm (30.63 in.)

- Check steering lower shaft for specified length.

Specified length

For left hand steering vehicle:

"A": 435.9 mm (17.16 in.)

"A": 395.1 mm (15.56 in.) (For vehicle with power steering system)

For right hand steering vehicle:

"B": 434.7 mm (17.11 in.)

"B": 393.9 mm (15.51 in.) (For vehicle with power steering system)

WARNING:

Never disassemble steering lower shaft assembly.
If it is found faulty, replace it with new assembly.

- 4) Check steering shaft for smooth rotation. If found defective, replace as column assembly.
- 5) Check steering shaft joints and shaft for any damages such as crack, breakage, malfunction or excessive play. If anything is found faulty, replace as shaft assembly.
- 6) Check steering shaft and column for bend, cracks or deformation.
If found defective, replace.

60A50-3C2-3-1S

SECTION 5

BRAKES

NOTE:

- For the descriptions (items) not found in this section of this manual, refer to the SECTION 5 of the Service Manual mentioned in FOREWORD of this manual.
- All brake fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts. There is to be no welding as it may result in extensive damage and weakening of the metal.

60A50-5-1-1S

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60A50-5-1-2S

GENERAL DESCRIPTION

When the foot brake pedal is depressed, hydraulic pressure is developed in the master cylinder to actuate pistons (two in front and four in rear).

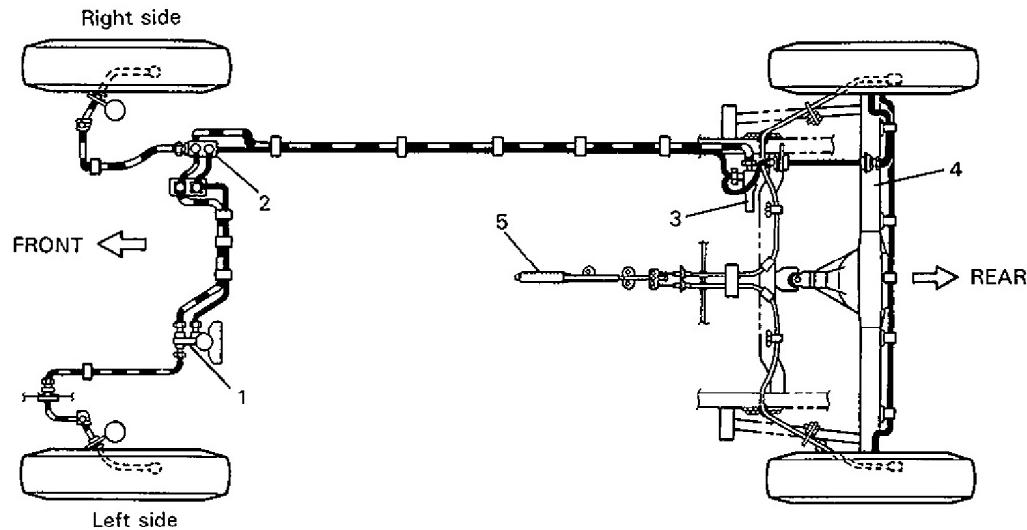
The master cylinder is a tandem master cylinder. Three brake pipes are connected to the master cylinder and they make two independent circuits. One connects front brakes (right and left) and the other connects rear brakes (right and left).

The load sensing proportioning valve (LSPV) is included in these circuits between the master cylinder and rear brakes.

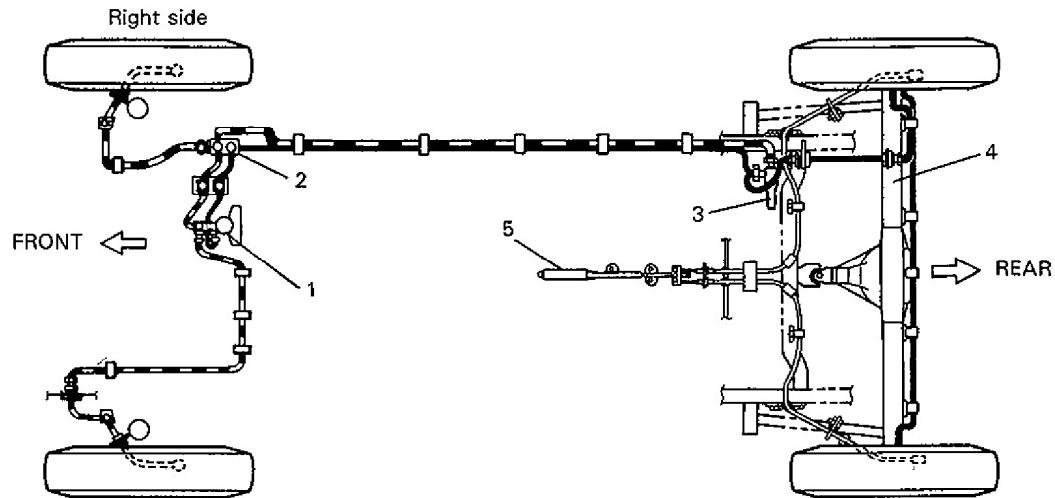
In this brake system, the disc brake type is used for the front wheel brake and a drum brake type (leading/trailing shoes) for the rear brake.

The parking brake system is mechanical. It applies brake force to only rear wheels by means of the cable and mechanical linkage system. The same brake shoes are used for both parking and foot brakes.

[FOR LEFT HAND STEERING VEHICLE]



[FOR RIGHT HAND STEERING VEHICLE]



- 1. Master cylinder
- 2. 5-way joint
- 3. LSPV (Load Sensing Proportioning Valve)
- 4. Rear axle housing
- 5. Parking brake lever

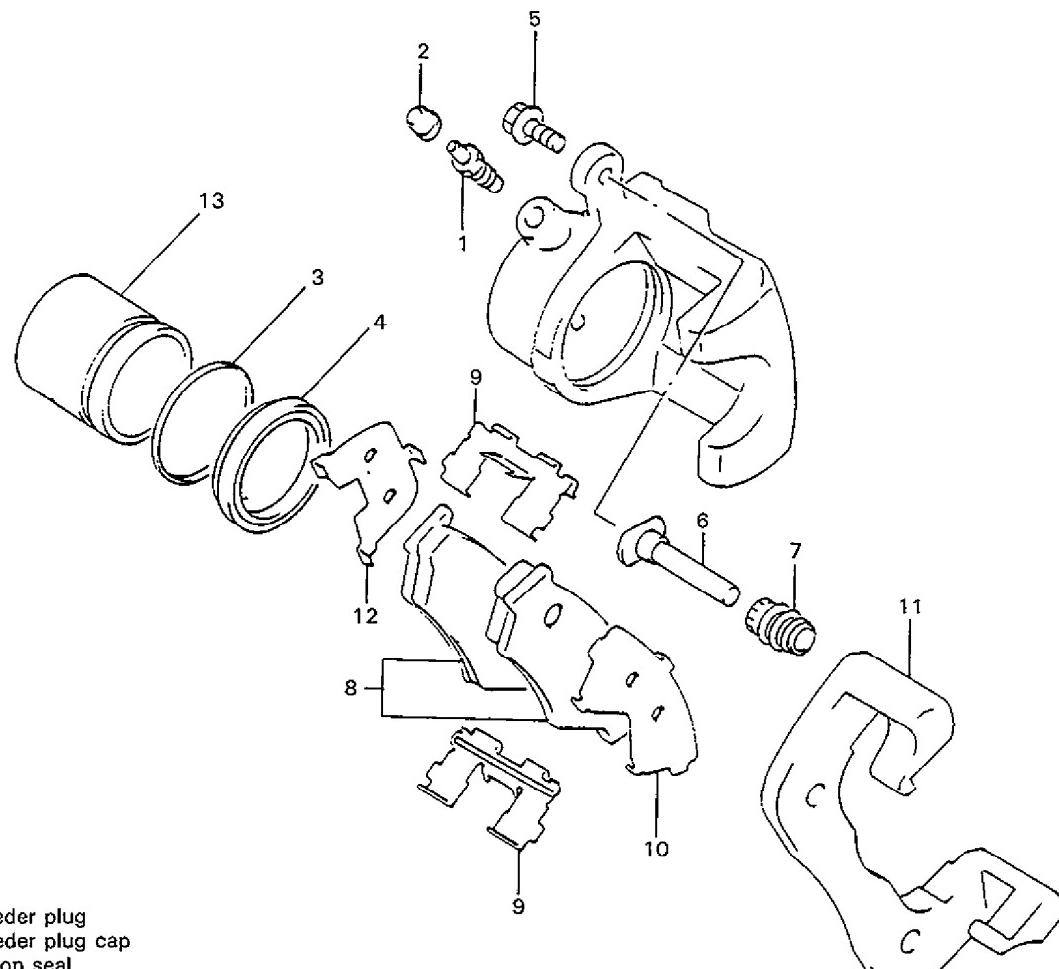
DISC BRAKE CALIPER ASSEMBLY

GENERAL DESCRIPTION

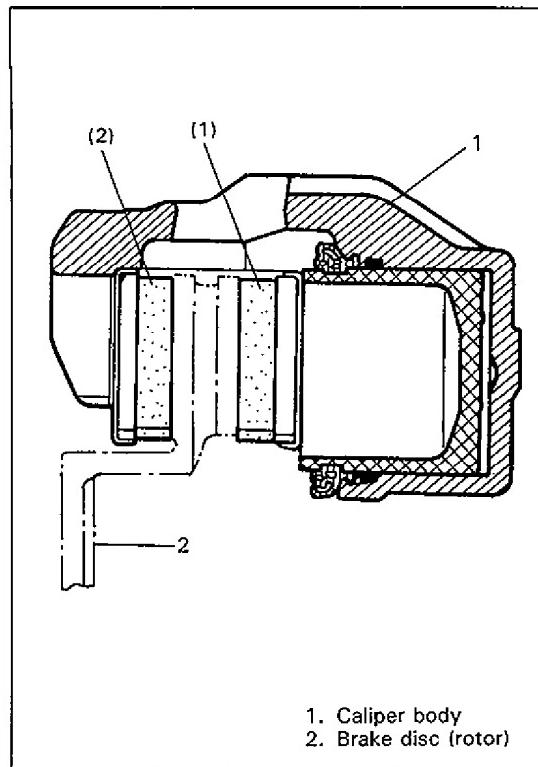
This caliper has a single 54.0 mm (2.124 in.) bore and is mounted to the brake caliper carrier with two caliper pin bolts. Hydraulic force, created by applying force to the brake pedal, is converted by the caliper to friction. The hydraulic force acts equally against the piston and the bottom of the caliper bore to move the piston outward and to move (slide) the caliper inward, resulting in a clamping action on the disc. This clamping action forces the pads (linings) against the disc, creating friction to stop the vehicle. For details, refer to OPERATION in the next page.

NOTE:

Lubricate parts as specified. Do not use lubricated shop air on brake parts as damage to rubber components may result. If any component is removed or line disconnected, bleed the brake system. Replace pads in axle sets only. The torque values specified are for dry, unlubricated fasteners.



1. Bleeder plug
2. Bleeder plug cap
3. Piston seal
4. Cylinder boot
5. Caliper pin bolt
6. Caliper pin
7. Boot
8. Pad
9. Pad spring
10. Anti noise shim
11. Brake caliper carrier
12. Anti noise shim
13. Disc brake piston



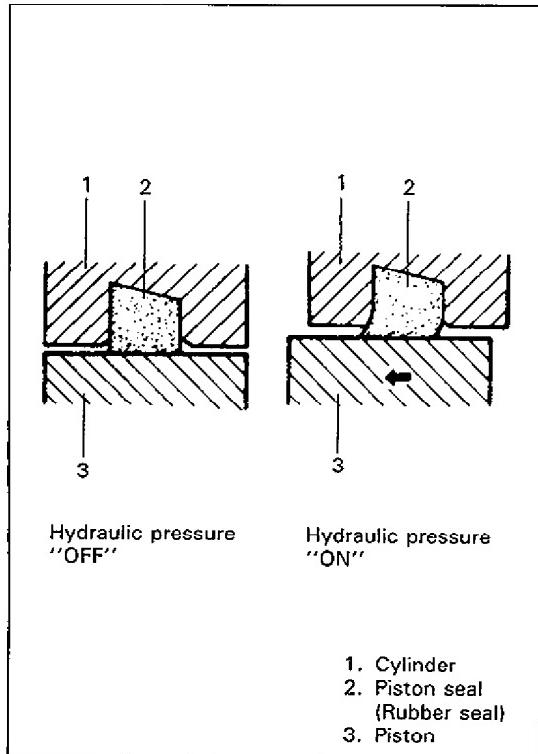
60A50-5-4-1S

Caliper OPERATION

Single piston floating caliper type

The single piston floating caliper type brake is employed in this model. One cylinder and one piston are used for this type. (The cylinder is constructed as a monoblock with the caliper.) Fluid pressure generated in the cylinder causes the pad (1) on the piston side to press against the disc. At the same time, the floating type caliper body is moved to the right by the cylinder pressure, as shown in figure, which pulls pad (2) against the disc and so brakes the wheel.

60A50-5-4-3S



60A50-5-4-4S

Clearance correction

When oil pressure is applied to the piston, the piston moves forward. The rubber seal, which exerts considerable pressure against the piston, moves with the cylinder. However, as a part of the rubber seal has been fixed into a groove in the cylinder, the shape of the rubber seal is distorted toward internal end of the cylinder, as shown in figure. When pressure is taken off from the foot brake pedal and fluid pressure is released from the piston, a restoring force is generated at the seal and pushes the piston back. As the pads wear away and the clearance between the disc and pads becomes larger, the piston moves a larger distance. The seal then could change in shape further but, since the end of the seal is fixed into the groove in the cylinder, the distortion is limited to the same amount as previously described. The piston moves further to cover the distance of clearance. The piston returns by the same distance and the rubber seal recovers its shape as described above and thus the clearance between the disc and pads is maintained in adjustment.

DRUM BRAKE ASSEMBLY

GENERAL DESCRIPTION

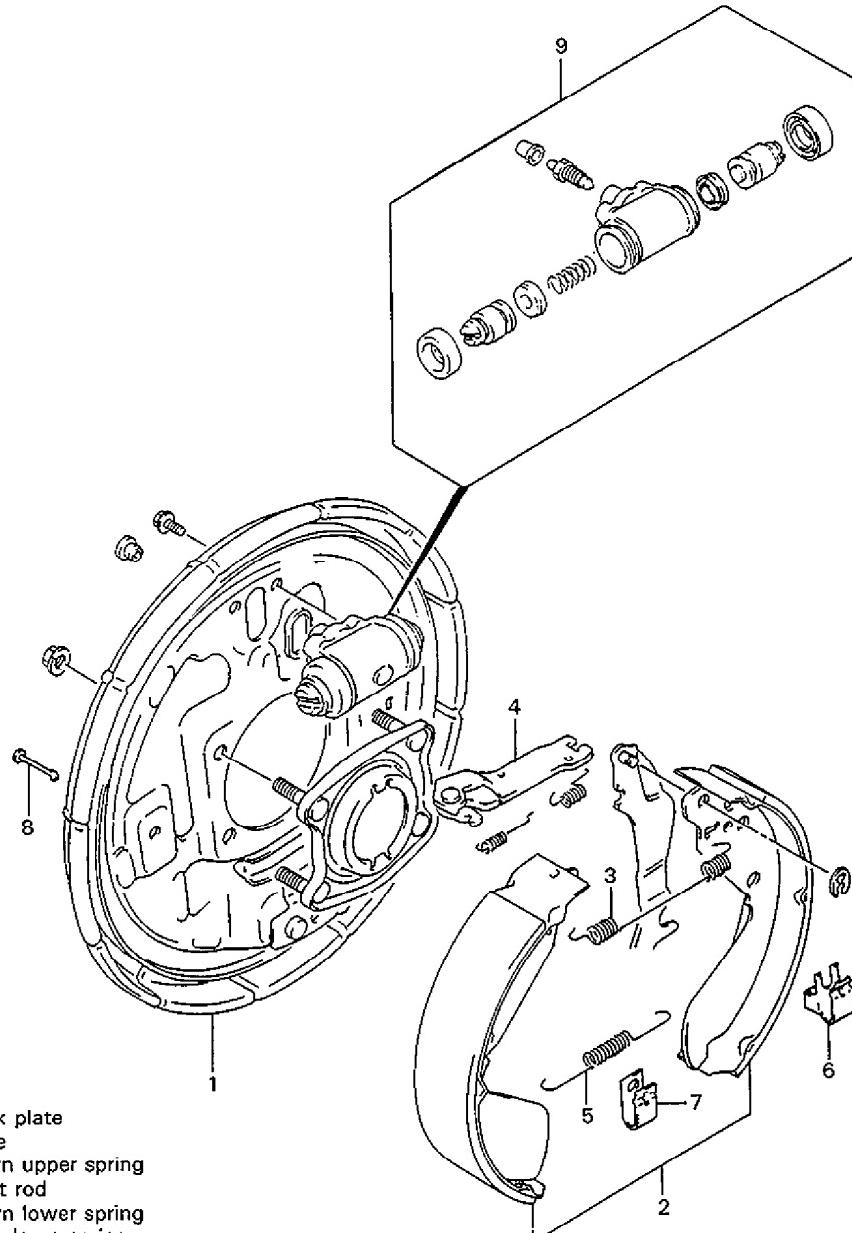
The drum brake assembly has a self shoe clearance adjusting system so that drum-to-shoe clearance is maintained appropriate at all times. For details, refer to OPERATION in the next page.

NOTE:

Replace all components included in repair kits to service this drum brake. Lubricate parts as specified.

WARNING:

If any hydraulic component is removed or brake line disconnected, bleed the brake system. The torque values specified are for dry, unlubricated fasteners.

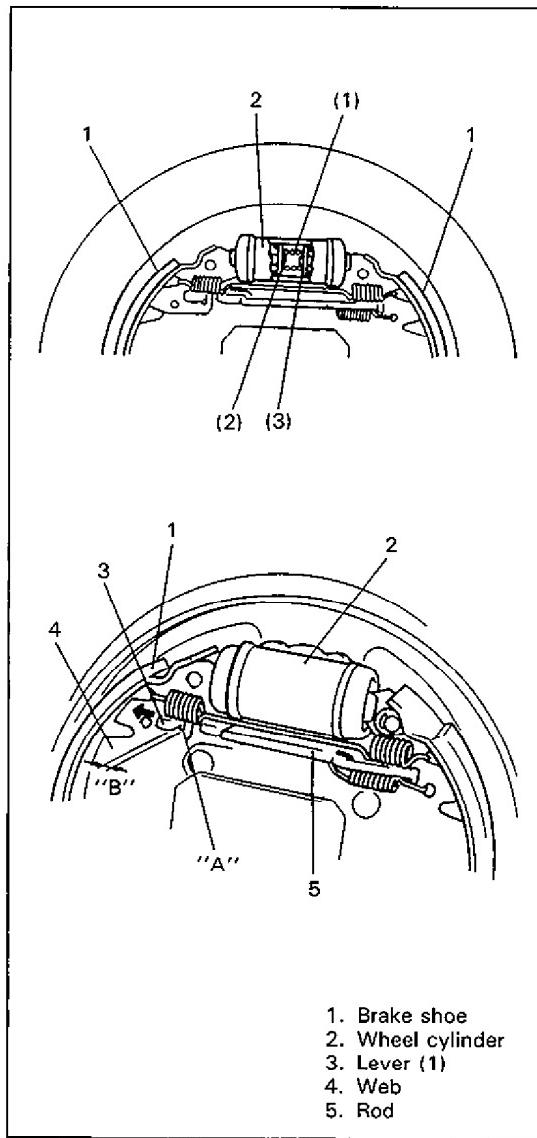


Rear Brake OPERATION

With the general drum brake type, when the brake pedal is depressed, two pistons in the wheel cylinder force the brake shoes outward, restraining the turn of the drum.

The more the brake shoes get worn, the longer distance the pistons must move. As a result, the brake pedal travel (pedal-to-wall clearance) increases. Then the shoe clearance must be adjusted by the shoe adjusting screws. Thus periodical adjustment is required for the drum brake type in general. This rear brake is provided with a self-adjusting system which automatically adjusts the shoe-to-drum clearance (pedal-to-wall clearance) caused by such brake shoe wear.

60A50-5-6-1S



60A50-5-6-2S

Clearance correction

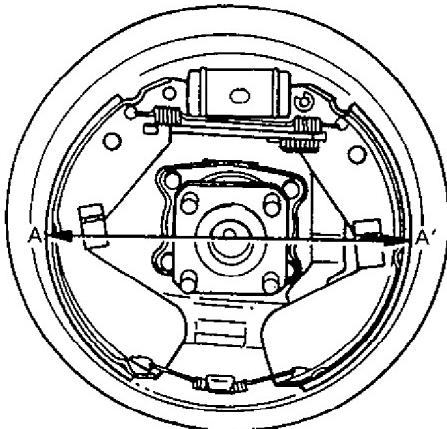
In each rear wheel cylinder, pistons, piston cups, and a piston spring (1) are installed. When the brake pedal is depressed, fluid pressure is applied to the inside of the chamber on the pistons (2) and (3).

Being actuated by this pressure, the piston (2) moves to the left (piston (3) moves to the right) in the following figure and presses the brake shoe against the brake drum, thus producing brake force.

At this time, the distance the brake shoe moves is "B", that is, the distance that "A" (the end of the long hole made in the brake shoe web) moves till it contacts the lever (1) which is fitted in the long hole.

When the brake pedal is depressed, the piston and brake shoe move toward the brake drum side by the aforementioned distance "B" and "A" of the brake shoe web contacts the lever (1).

As the brake shoe gets worn and the brake shoe clearance becomes larger, the force applied to the lever (1) at the time of such a contact becomes larger. When it exceeds 10 — 12 kg (22 — 26 lbs), the "A" of the brake shoe web moves the lever (1) as much as the amount of the brake shoe lining wear toward the direction as shown with an arrow in the figure. Thus the shoe is forced against the drum and the brake force is produced.



60A50-5-7-1S

The distance the lever (1) moves corresponds to the amount of wear. In accordance with the lever (1) movement, the fan-shaped ratchet (2) also moves, for they are assembled as a unit. The lever (1) and ratchet (2) remain in the positions as they moved until the shoe-to-drum clearance becomes even larger.

When the brake pedal is released, the brake shoe is allowed to move back by the amount of clearance "B" by means of the return spring. In this way, the brake shoe-to-drum clearance is automatically adjusted constant every time the brake pedal is depressed.

The brake shoe-to-drum clearance "B" corresponds to 0.5 – 0.6 mm (0.0196 – 0.0236 in.) in terms of the brake drum diameter A ↔ A'. And the amount adjusted by one notch of the ratchet corresponds to 0.20 mm (0.008 in.) in terms of the brake drum diameter A ↔ A'.

The spring provided in the wheel cylinder prevents the piston from moving back more than the specified brake shoe-to-drum clearance.

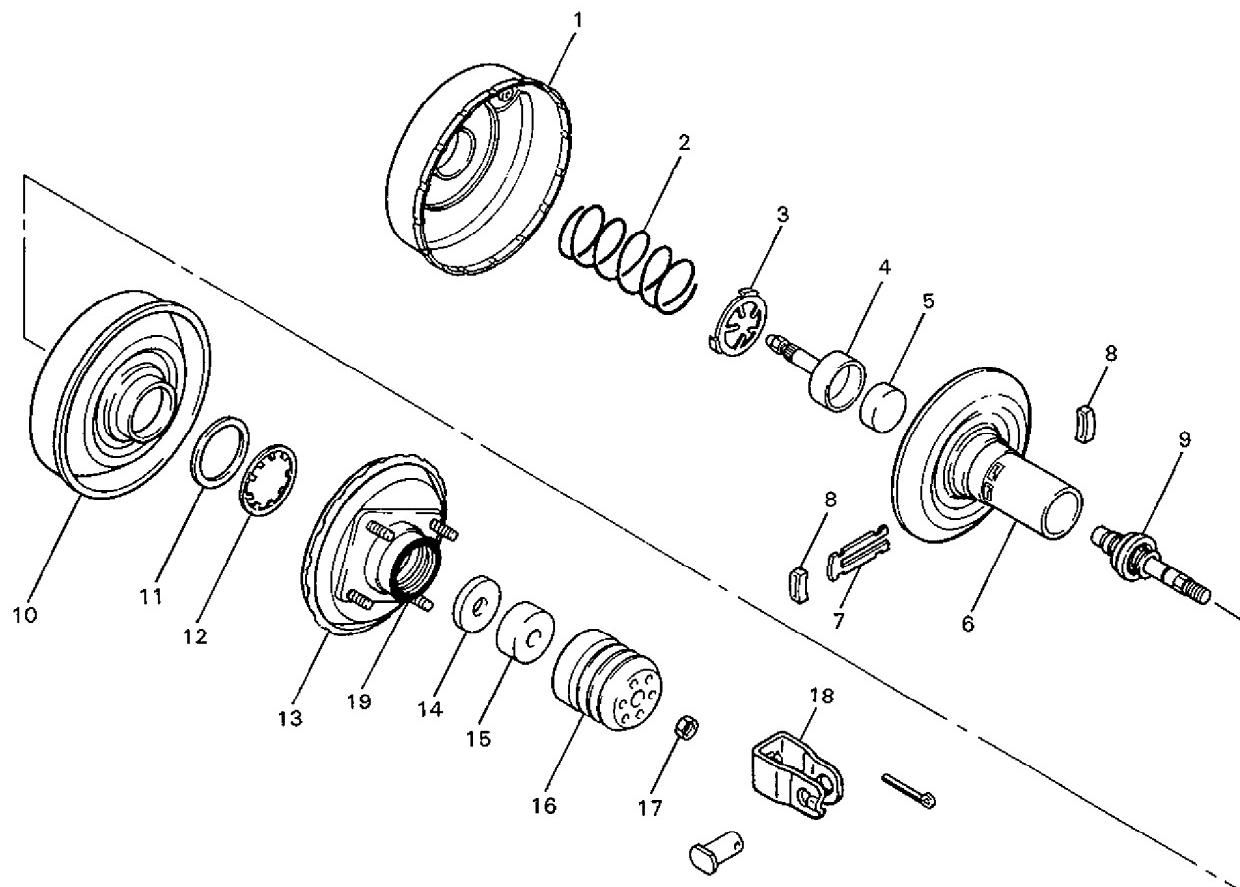
BOOSTER ASSEMBLY

GENERAL DESCRIPTION

The booster is located between the master cylinder and the brake pedal. It is so designed that the force created when the brake pedal is depressed is mechanically increased combined with the engine vacuum. The booster has a diaphragm of Ø 8 in (203 mm) effective diameter.

NOTE:

- Use all components included in repair kits to service this booster. Lubricate rubber parts, where indicated, with silicone grease provided in kits. The torque values specified are for dry, unlubricated fasteners. If any hydraulic component is removed or brake line disconnected, bleed the brake system.
- Never lubricate any hydraulic component with silicone grease.



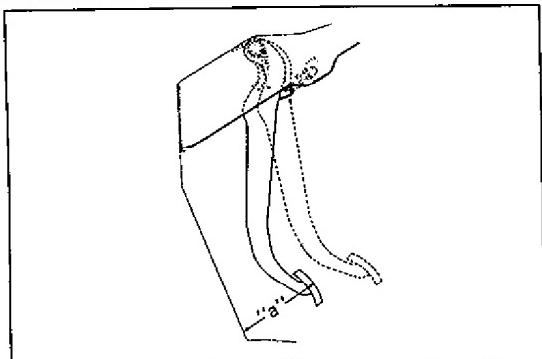
- | | |
|---------------------------------|----------------------------|
| 1. Booster No. 1 body | 11. Diaphragm retainer |
| 2. Booster piston return spring | 12. Diaphragm stopper ring |
| 3. Rod retainer | 13. Booster No. 2 body |
| 4. Piston rod | 14. Air cleaner separator |
| 5. Reaction disc | 15. Air cleaner element |
| 6. Booster piston | 16. Body boot |
| 7. Valve stopper key | 17. Nut |
| 8. Key cushion | 18. Push rod clevis |
| 9. Booster air valve assembly | 19. No. 2 body oil seal |
| 10. Diaphragm | |

ON VEHICLE SERVICE

1. BRAKE PEDAL FREE HEIGHT ADJUSTMENT

- 1) When booster push rod clevis has been reinstalled, it is important that measurement between booster mounting surface (with a gasket attached) and center of clevis pin hole is adjusted within 126.1 mm — 127.1 mm (4.96 — 5.00 in.). (See page 5-22.)
- 2) When stop light switch has been removed, refer to the following STOP LIGHT SWITCH ADJUSTMENT for proper installation.
Services in above steps 1) and 2) may affect brake pedal height.

60A50-5-9-1S



60A50-5-9-2S

2. EXCESSIVE PEDAL TRAVEL CHECK

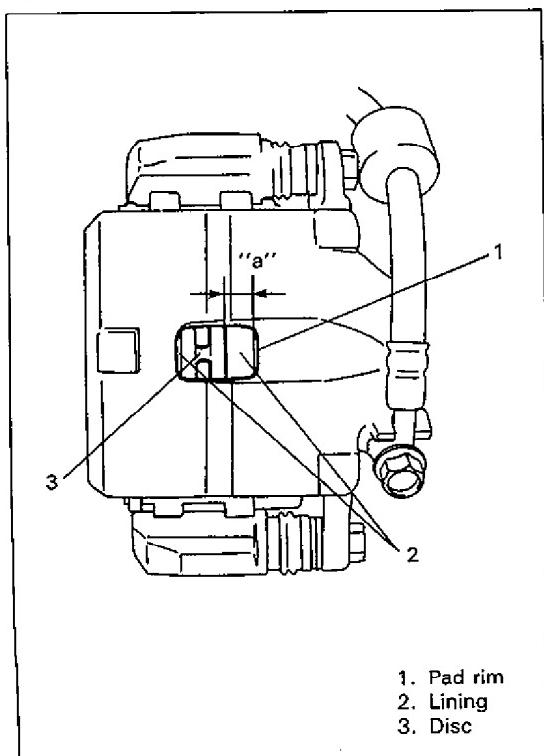
- 1) Start engine.
- 2) Depress brake pedal a few times.
- 3) With brake pedal depressed with approximately 30 kg (66 lbs) load, measure pedal to wall clearance.

Clearance "a": Over 120 mm (4.72 in.)

3. DISC INSPECTION

Refer to page 5-16 of this section for inspection point and procedure.

60A50-5-9-3S



4. PAD LINING INSPECTION

Inspect pad linings periodically according to maintenance schedule whenever wheels are removed (for tire rotation or other reason). Take a look through hole of caliper and check lining thickness of outside and inside pads.

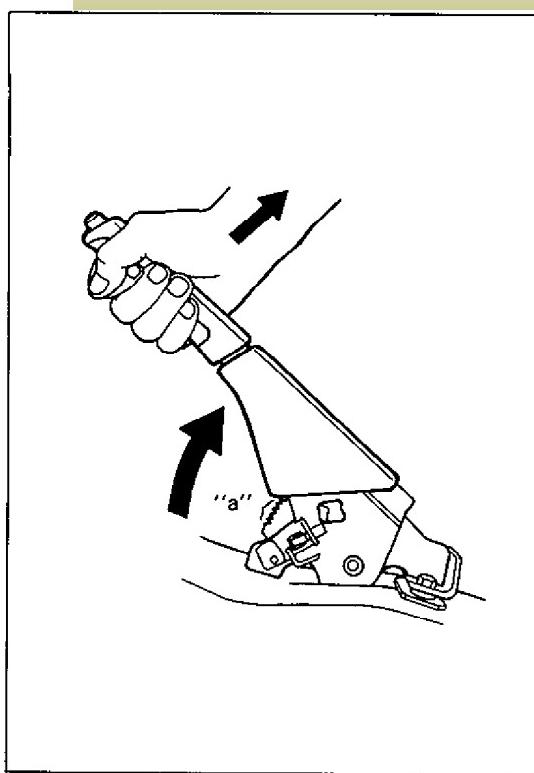
Thickness "a"

Standard: 10.0 mm (0.39 in.)

Service Limit: 2.5 mm (0.10 in.)

If one of brake pad is worn to service limit, all linings must be replaced at the same time.

60A50-5-9-4S



60A50-5-10-1S

5. PARKING BRAKE INSPECTION AND ADJUSTMENT

a) Inspection

Hold center of parking brake lever grip and pull it up with 20 to 25 kg (44 to 55 lbs) force.

With parking brake lever pulled up as above, count ratchet notches in "A" as shown in figure.

There should be 7 to 9 notches.

Also, check if both right and left rear wheels are locked firmly. To count number of notches easily, listen to click sounds that ratchet makes while pulling parking brake lever without pressing its button.

One click sound corresponds to one notch.

Parking brake lever travel

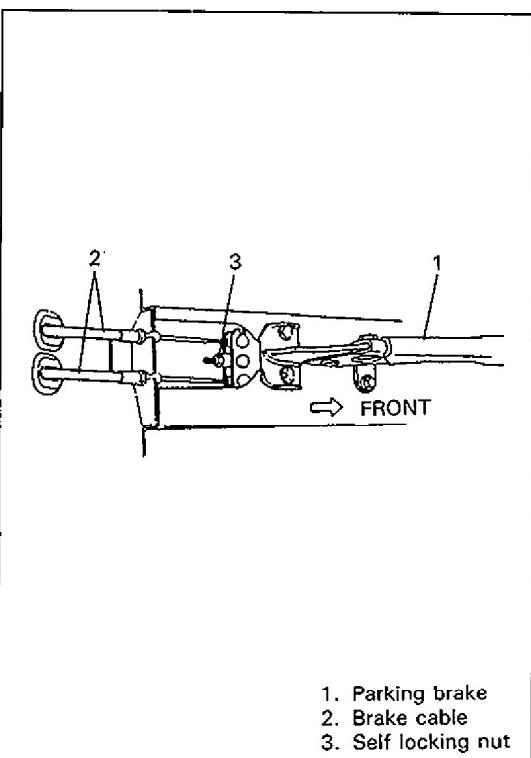
"a": 7 — 9 notches (With 20 kg or 44 lbs of pull pressure)

If number of notches is out of specification, adjust cable by referring to adjustment procedure described on the following step b) so as to obtain specified parking brake stroke.

NOTE:

Check tooth tip of each notch for damage or wear. If any damage or wear is found, replace parking brake lever.

60A50-5-10-3S



b) Adjustment

NOTE:

Make sure for following conditions before cable adjustment.

- No air is trapped in brake system.
- Brake pedal travel is proper.
- Brake pedal has been depressed a few times with about 30 kg (66 lbs) load.
- Parking brake lever has been pulled up a few times with about 20 kg force.
- Rear brake shoes are not worn beyond limit, and self adjusting mechanism operates properly.
- To slacken parking brake cable, loosen self-locking nut as far as end of bolt. Then depress brake pedal a few times with about 30 kg (66 lbs) load.

After confirming that above 6 conditions are all satisfied, adjust parking brake lever stroke by loosening or tightening self locking nut (3 in figure).

NOTE:

Check brake drum for dragging after adjustment.

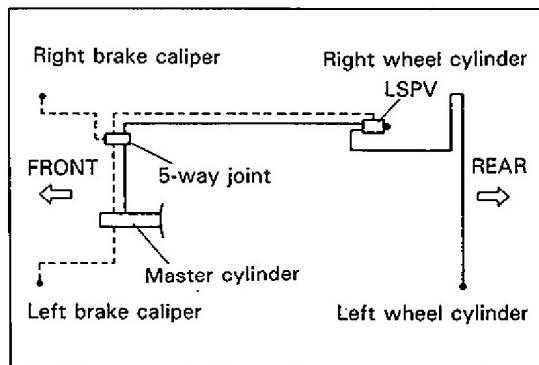
60A50-5-10-4S

6. BLEEDING BRAKES

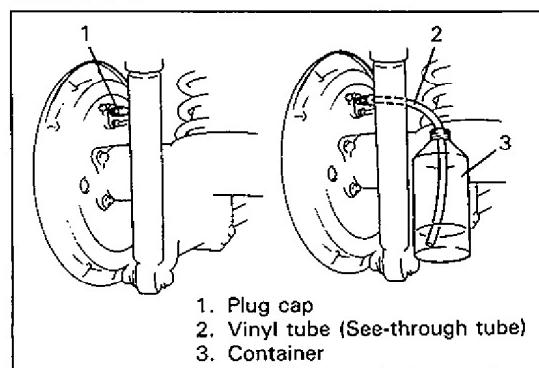
NOTE:

- Brake fluid is extremely damaging to paint. If fluid should accidentally touch painted surface, immediately wipe fluid from paint and clean painted surface.
- When master cylinder has been removed or disassembled, or brake pipe has been disconnected from master cylinder, bleed air from master cylinder to facilitate bleeding air of brake system. (Refer to item 7 BLEEDING AIR FROM MASTER CYLINDER.) Then proceed to following operation.

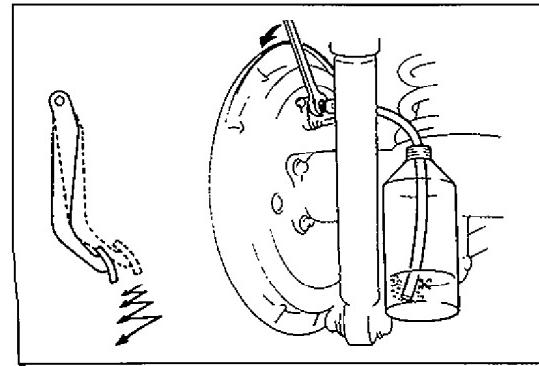
60A50-5-11-1S



60A50-5-11-3S



60A50-5-11-4S



Bleeding operation is necessary to remove air whenever it entered hydraulic brake system.

Hydraulic lines of brake system consists of two separate lines, one for front wheel brakes and the other for rear wheel brakes. Air bleeding is necessary at right and left front wheel brakes, left rear wheel brake and LSPV, i.e. 4 places in all. Be sure to bleed air of brake system according to following procedure when its hydraulic circuit has been disconnected.

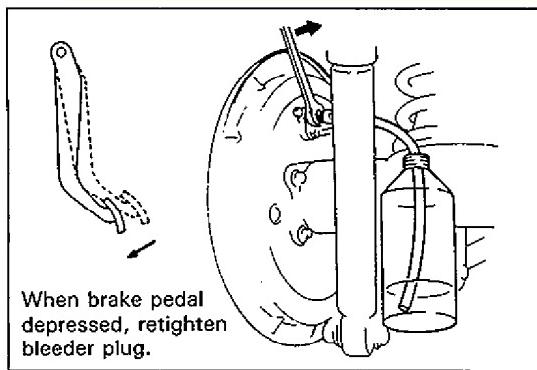
- 1) Fill master cylinder reservoir with brake fluid and keep at least one-half full of fluid during bleeding operation.

- 2) Remove bleeder plug cap.

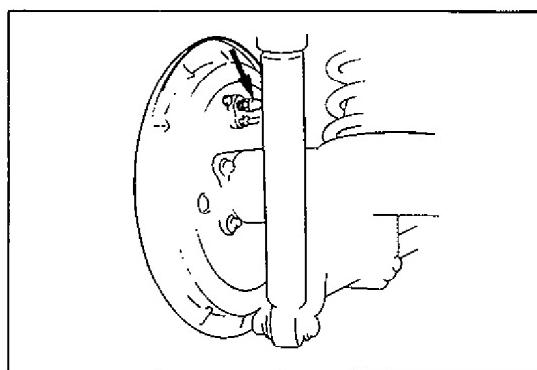
Attach a vinyl tube to bleeder plug of wheel cylinder, and insert the other end into container.

- 3) Depress brake pedal several times, and then while holding it depressed, loosen bleeder plug about one-third to one-half turn.

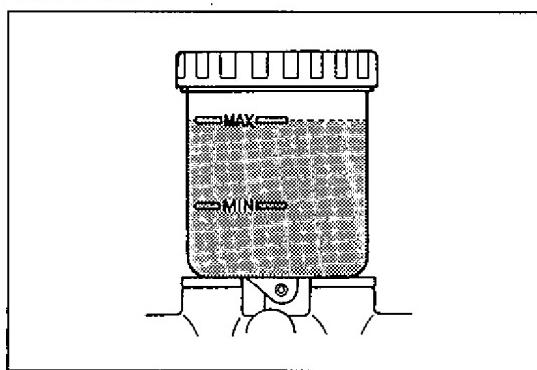
60A50-5-11-5S



60A50-5-12-1S



60A50-5-12-2S



60A50-5-12-3S

- 4) When fluid pressure in the cylinder is almost depleted, retighten bleeder plug.

- 5) Repeat this operation until there are no more air bubbles in hydraulic line.

- 6) When bubbles stop, depress and hold brake pedal and tighten bleeder plug.

(For tightening torque specification of air bleeder plug, see page 5-23.)

- 7) Then attach bleeder plug cap.

- 8) After completing bleeding operation, apply fluid pressure to pipe line and check for leakage.

- 9) Replenish fluid into reservoir up to specified level.

- 10) Check brake pedal for "sponginess". If found spongy, repeat entire procedure of bleeding.

60A50-5-12-4S

7. BLEEDING AIR FROM MASTER CYLINDER

NOTE:

Brake fluid is extremely damaging to paint. If fluid should accidentally touch painted surface, immediately wipe fluid from paint and clean painted surface.

When master cylinder has been removed or disassembled, or brake pipe has been disconnected from master cylinder, bleed air from master cylinder first to facilitate bleeding air of brake system.

Bleeding air from master cylinder

- 1) Fill master cylinder reservoir with specified brake fluid and wait for at least 1 minute.
- 2) Disconnect brake pipe from primary side (for rear brake).
- 3) With discharge port opened, depress brake pedal gradually. Then with discharge port closed with finger, release brake pedal gradually and keep it closed for about 5 seconds before depressing brake pedal again.
- 4) Repeat what is described in above 3) till liquid comes out of discharge port. After that, repeat still the same procedure at least 3 times and then connect primary side brake pipe.
- 5) Disconnect 2 brake pipes from secondary side (for front brake).
- 6) With 2 discharge ports closed with fingers, repeat the same procedure as described in above 3) till liquid comes out of discharge port. After that repeat still the same procedure at least 3 times and then reconnect 2 brake pipes.
- 7) Upon completion of above steps, proceed to operation as described under item 6. BLEEDING BRAKES.

BRAKE HOSE/PIPE R & I

1. REMOVE AND INSTALL FRONT BRAKE HOSE/PIPE

1) Raise and suitably support vehicle. Remove tire and wheel.

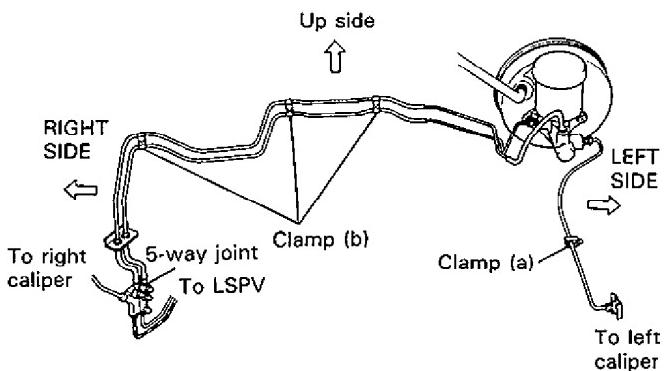
This operation is not necessary when removing pipes connecting master cylinder and flexible hose.

2) Clean dirt and foreign material from both hose end or pipe end fittings. Remove brake hose or pipe.

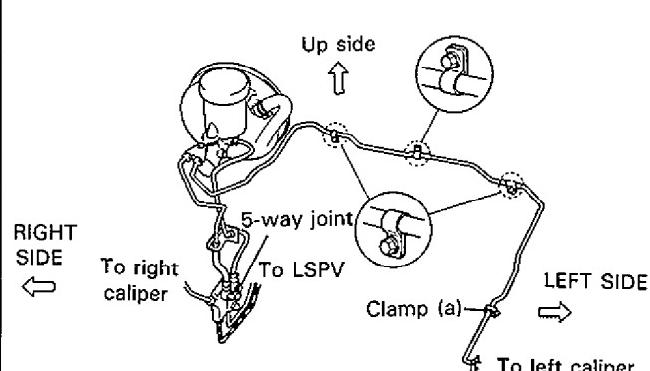
3) Reverse removal procedure for brake hose or pipe installation.

For installation, make sure that steering wheel is in straightforward position and hose has no twist or kink. Check to make sure that hose doesn't contact any part of suspension, both in extreme right and extreme left turn conditions. If it does at any point, remove and correct. Fill and maintain brake fluid level in reservoir. Bleed brake system.

[Left hand steering vehicle]

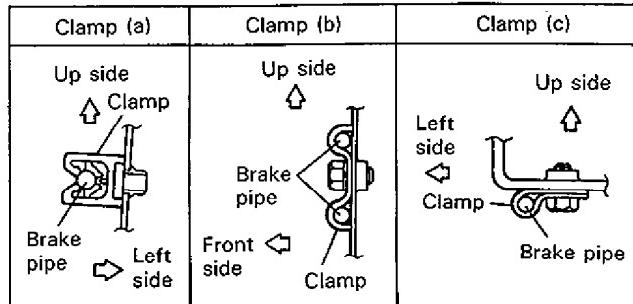


[Right hand steering vehicle]



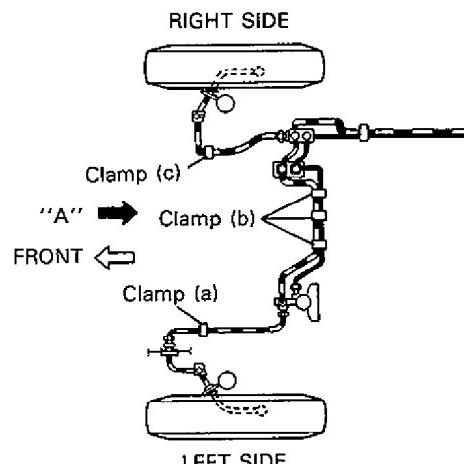
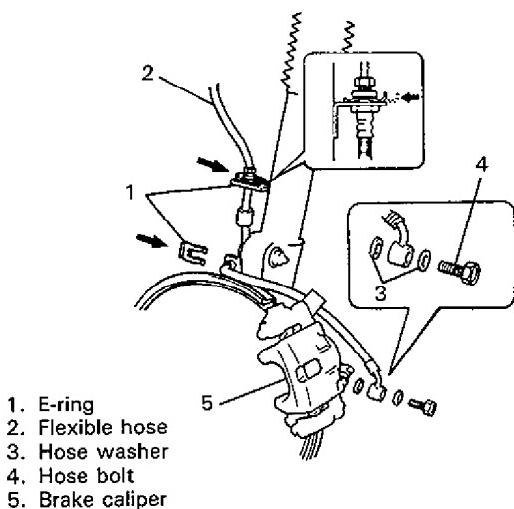
Viewed from arrow "A"

	N·m	kg·m	lb·ft
Tightening torque for brake pipe flare nuts	14–18	1.4–1.8	10.5–13.0
Tightening torque for 5-way joint bolt	8–12	0.8–1.2	6.0–8.5



NOTE:

Insert E-ring till its end surface is flush with or lower than bracket end surface.

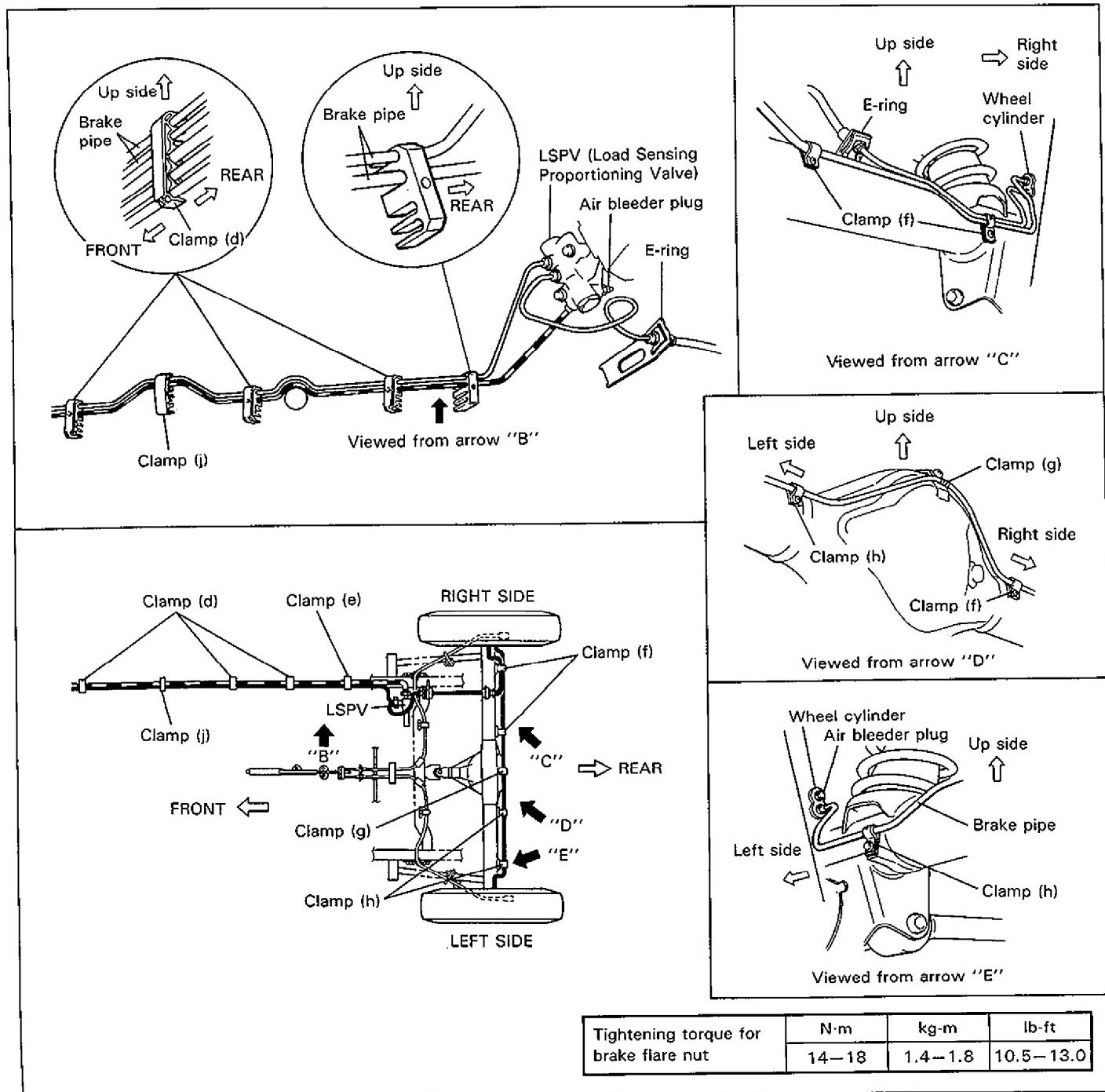


2. REMOVE AND INSTALL REAR BRAKE HOSE/PIPE

- 1) Raise and suitably support vehicle. Remove tire and wheel.
- 2) Clean dirt and foreign material from both hose end or pipe end fittings. Remove brake hose or pipe.
- 3) Reverse removal procedure for brake hose or pipe installation. Fill and maintain brake fluid level in reservoir. Bleed brake system.

PRECAUTION FOR INSTALLATION

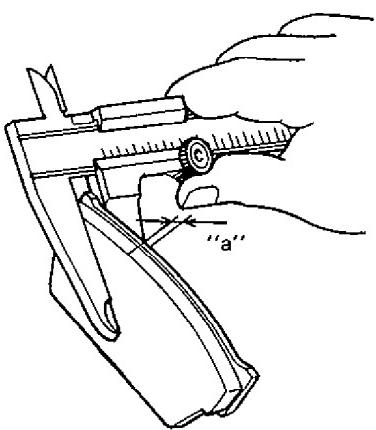
- Position clamps(d) to white marks on two brake pipes.
- Be sure to obtain more than 3 mm (0.118 in.) clearance between axle housing and brake pipe.
- Install clamps properly referring to figure below and tighten bolts.
- When installing hose, make sure that it has no twist or kink.



DISC BRAKE INSPECTION

1. INSPECT BRAKE PAD LINING

Check pad lining for wear. When wear exceeds limit, replace with new one.



CAUTION:

Never polish pad lining with sandpaper. If lining is polished with sandpaper, hard particles of sandpaper will be deposited in lining and may damage disc. When pad lining requires correction, replace it with a new one.

Pad thickness (lining + rim) "a"

Standard: 15.5 mm (0.610 in.)

Service limit: 8.0 mm (0.315 in.)

NOTE:

When pads are removed, visually inspect caliper for brake fluid leak. Correct leaky point, if any.

60A50-5-16-1S

2. INSPECT BRAKE DISC

Before this inspection, brake pads must be removed.

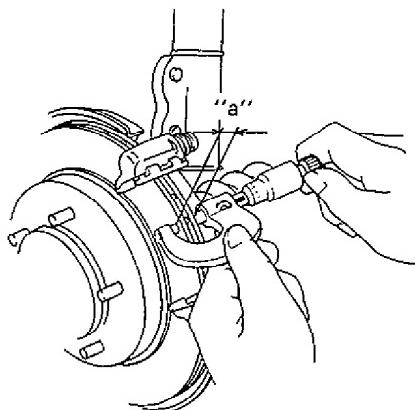
Check disc surface for scratches in wearing parts. Scratches on disc surface noticed at the time of specified inspection or replacement are normal and disc is not defective unless they are serious.

But when there are deep scratches or scratches all over disc surface, replace it. When only one side is scratched, polish and correct that side.

Disc thickness "a"

Standard: 17.0 mm (0.669 in.)

Service limit: 15.0 mm (0.591 in.)



60A50-5-16-3S

To measure deflection of disc, take measurement at 2 points on its periphery and center with dial gauge while rotating it.

Limit on disc deflection: 0.15 mm (0.006 in.)

NOTE:

Check front wheel bearing for looseness before measurement.

BRAKE DRUM AND COMPONENTS INSPECTION

1. INSPECT BRAKE DRUM

Inspect drum for cleanliness. Check wear of its braking surface by measuring its inside diameter.

Brake drum ID "a"

Standard: 254 mm (10.00 in)

Service limit: 256 mm (10.07 in)

Whenever brake drums are removed, they should be thoroughly cleaned and inspected for cracks, scores, deep grooves.

Cracked, Scored, or Grooved Drum

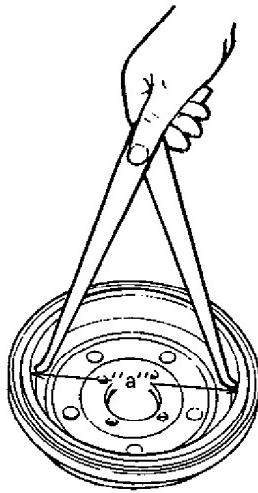
A cracked drum is unsafe for further service and must be replaced. Do not attempt to weld a cracked drum.

Smooth up any slight scores. Heavy or extensive scoring will cause excessive brake lining wear and it will probably be necessary to resurface drum braking surface.

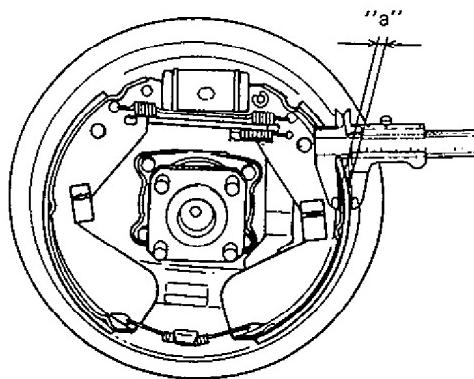
If brake linings are slightly worn and drum is grooved, drum sholud be polished with fine emery cloth but should not be turned.

NOTE:

When drum is removed, visually inspect wheel cylinder for brake fluid leakage. Correct leaky point, if any.



60A50-5-17-1S



60A50-5-17-4S

2. INSPECT BRAKE SHOE & LINING

Where lining is worn out beyond service limit, replace shoe.

Thickness (lining + shoe rim) "a"

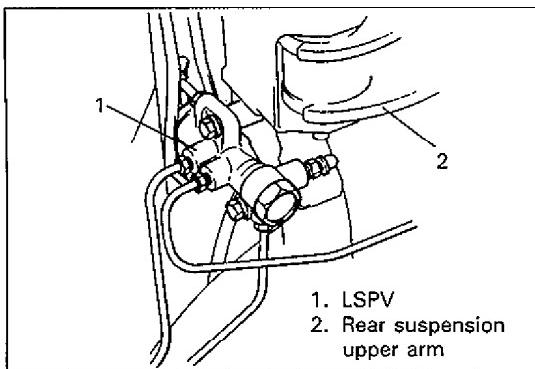
Standard: 7.5 mm (0.30 in)

Service limit: 3.0 mm (0.12 in)

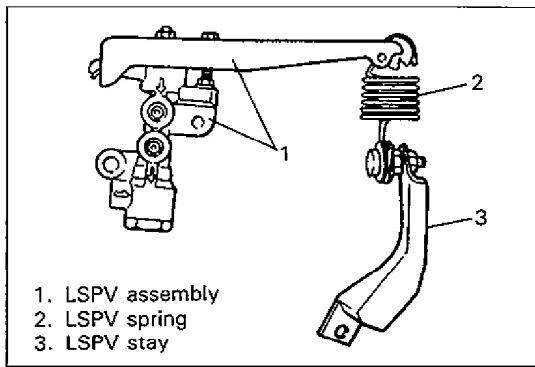
If one of brake linings is worn to service limit, all linings must be replaced at the same time.

CAUTION:

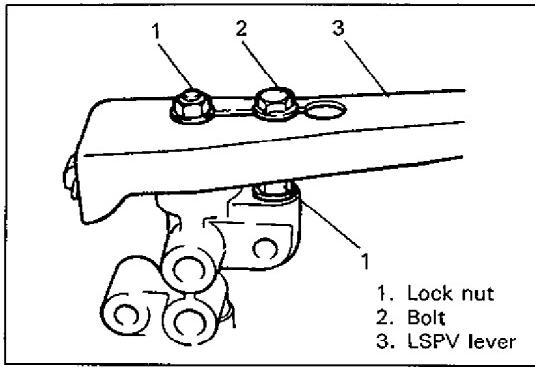
Never polish lining with sandpaper. If lining is polished with sandpaper, hard particles of sandpaper will be deposited in lining and may damage drum. When it is required to correct lining, replace it with a new one.



60A50-5-18-1S



60A50-5-18-2S



60A50-5-18-3S

LSPV (Load Sensing Proportioning Valve) R & I

1. REMOVE AND INSTALL LSPV

REMOVAL

- 1) Clean around reservoir cap and take out fluid with syringe or such.
- 2) Hoist vehicle.
- 3) Disconnect brake pipes from LSPV.
- 4) Remove LSPV assembly from vehicle body.

NOTE:

As shown in figure, LSPV assembly should be removed together with its spring and stay installed as they are.

- 5) Remove spring and stay from lever.

CAUTION:

- None of indicated nuts and bolt of LSPV assembly should be loosened or tightened.
- LSPV assembly must not be disassembled.
Replace with new one if defective.

INSTALLATION

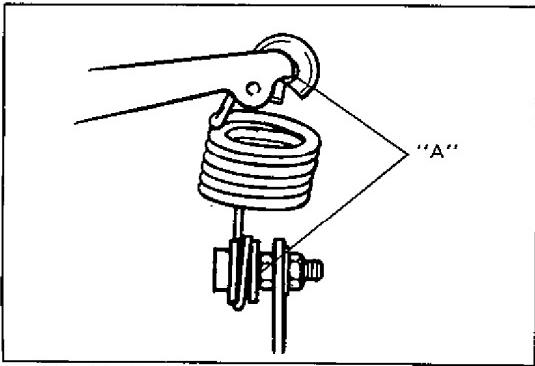
CAUTION:

Refer to above CAUTION.

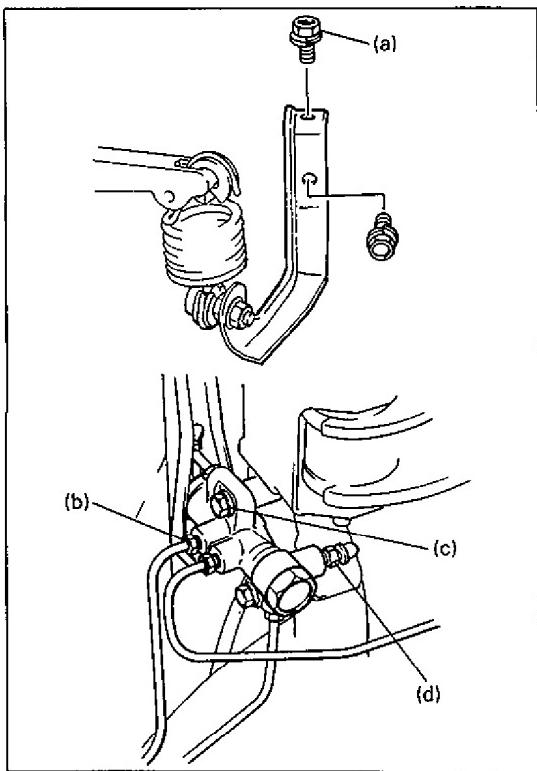
Install by reversing removal procedure, noting the following.

- 1) Apply grease to upper and lower joint of coil spring.

"A": Multi-purpose grease



60A50-5-18-5S



60A50-5-19-1S

2) Torque each bolt and nut to specification.

Tightening torque

- (a): 18–28 N·m (1.8–2.8 kg-m, 13.5–20.0 lb-ft)
- (b): 14–18 N·m (1.4–1.8 kg-m, 10.5–13.0 lb-ft)
- (c): 18–28 N·m (1.8–2.8 kg-m, 13.5–20.0 lb-ft)
- (d): 10–13 N·m (1.0–1.3 kg-m, 7.5–9.0 lb-ft)

3) Upon completion of installation, fill reservoir tank with specified fluid and bleed air from brake system.

NOTE:

Make sure to bleed air from LSPV bleeder without failure.

4) After bleeding air, check that LSPV is installed properly, referring to following INSPECTION & ADJUSTMENT section.

2. AFTER — INSTALLATION INSPECTION & ADJUSTMENT

Confirm the following before inspection and adjustment.

- Fuel tank is filled with fuel fully.
- Vehicle is equipped with spare tire, tools, jack and jack handle.
- Vehicle is free from any other load.

With vehicle in above conditions;

1) Place it on level floor.

2) Push up LSPV lever with finger till it contacts stopper bolt and measure length of coil spring ("a" in figure) as it is pulled.

3) Spring length "a" should be the value specified below.

Length "a": 99 mm (3.897 in.)

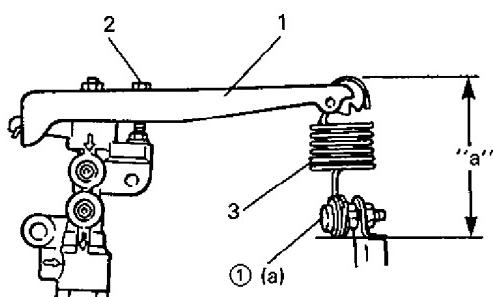
4) If it isn't, adjust it to specification by changing bolt ① tightening positions as shown. After adjustment, tighten nut to specified torque.

Tightening torque

- (a): 18–28 N·m (1.8–2.8 kg-m, 13.5–20.0 lb-ft)

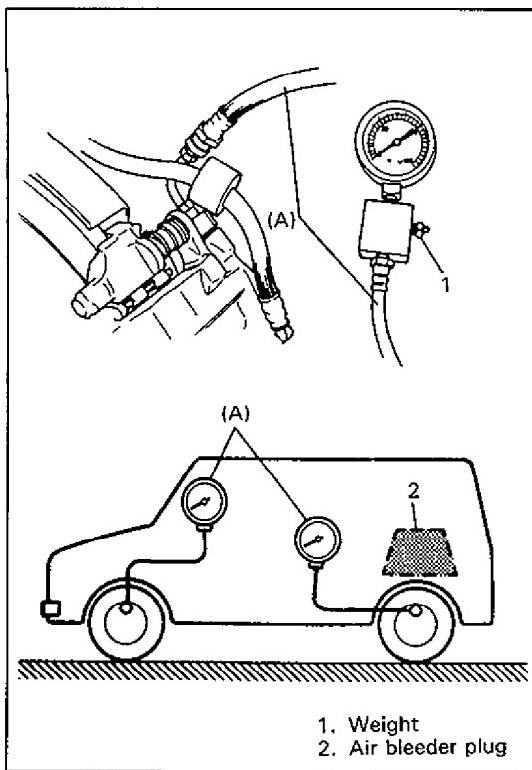
NOTE:

Check to make sure that LSPV body and brake pipe joints are free from fluid leakage. Replace defective parts, if any.

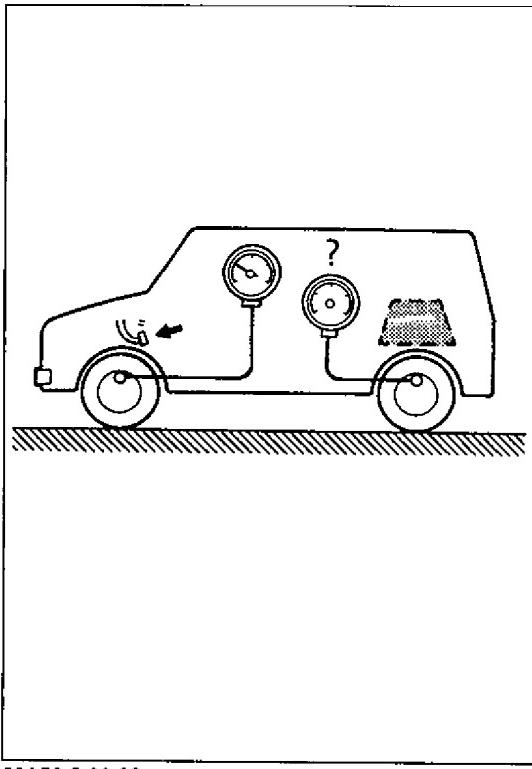


1. LSPV lever
2. Stopper bolt
3. Coil spring

60A50-5-19-3S



60A50-5-20-1S



60A50-5-20-3S

3. FLUID PRESSURE TEST

Test procedure for LSPV assembly is as follows.

Before testing, confirm the following.

- Fuel tank is filled with fuel fully.
- Vehicle is equipped with spare tire, tools, jack and jack handle.

- 1) Place vehicle on level floor and set 100 kg (221 lbs) weight slowly on axle housing center.
- 2) Install special tools (pressure gauge) to front and rear brake.

Special tool

(A): 09956-02310

NOTE:

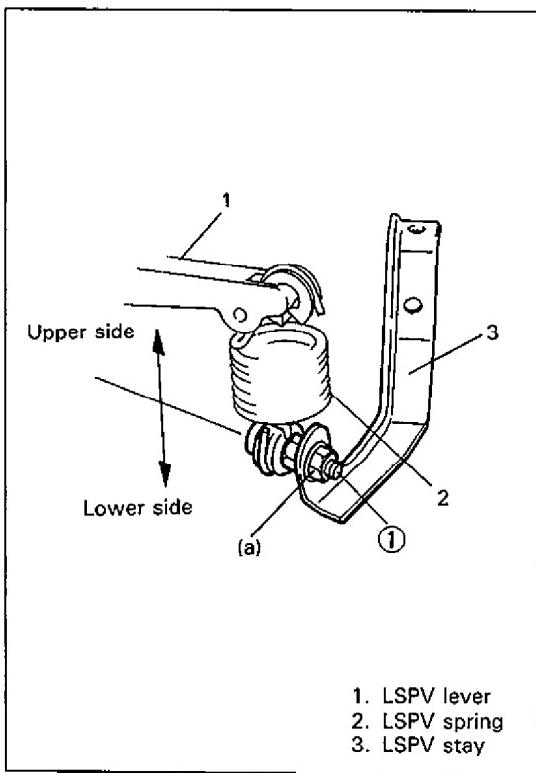
- Pressure gauge should be connected to **bleeder of front (left side brake) and rear brakes.**
- Bleed air from system.

- 3) Depress brake pedal gradually till fluid pressure of front brake becomes as specified below and check corresponding pressure of rear brake then. It should be within specification given below.

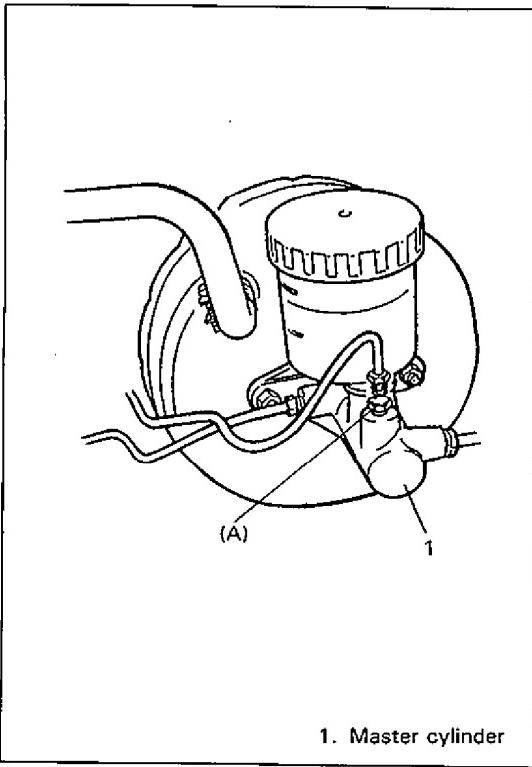
Front brake	Rear brake
5000 kPa	2600–3800 kPa
50 kg/cm ²	26–38 kg/cm ²
711 psi	370–540 psi

As done above, apply 100 kg/cm² pressure to front brake and check that rear brake pressure then is within specification as given below.

Front brake	Rear brake
10.000 kPa	3700–5100 kPa
100 kg/cm ²	37–51 kg/cm ²
1422 psi	526–725 psi



60A50-5-21-1S



60A50-5-21-3S

- 4) If rear brake pressure is not within specification, adjust it by changing bolt ① tightening position as follows.
- If rear brake pressure is higher than specification, move bolt ① upward and if it is lower, downward.
 - Repeat steps 3) and 4) until rear brake pressure is within specification.

NOTE:

1 mm of bolt movement will result in about 2.4 kg/cm² difference in hydraulic pressure.

- After adjustment, be sure to torque nut to specification.

Tightening torque

(a) : 18–28 N·m (1.8–2.8 kg-m, 13.5–20.0 lb-ft)

- 5) Disconnect brake pipe (connecting between master cylinder and right front brake) from master cylinder. Tighten special tool (plug) to master cylinder as shown. Depress brake pedal. If rear brake pressure is 95–100 kg/cm² when front brake pressure is 100 kg/cm², it means that front fail-safe system functions properly.

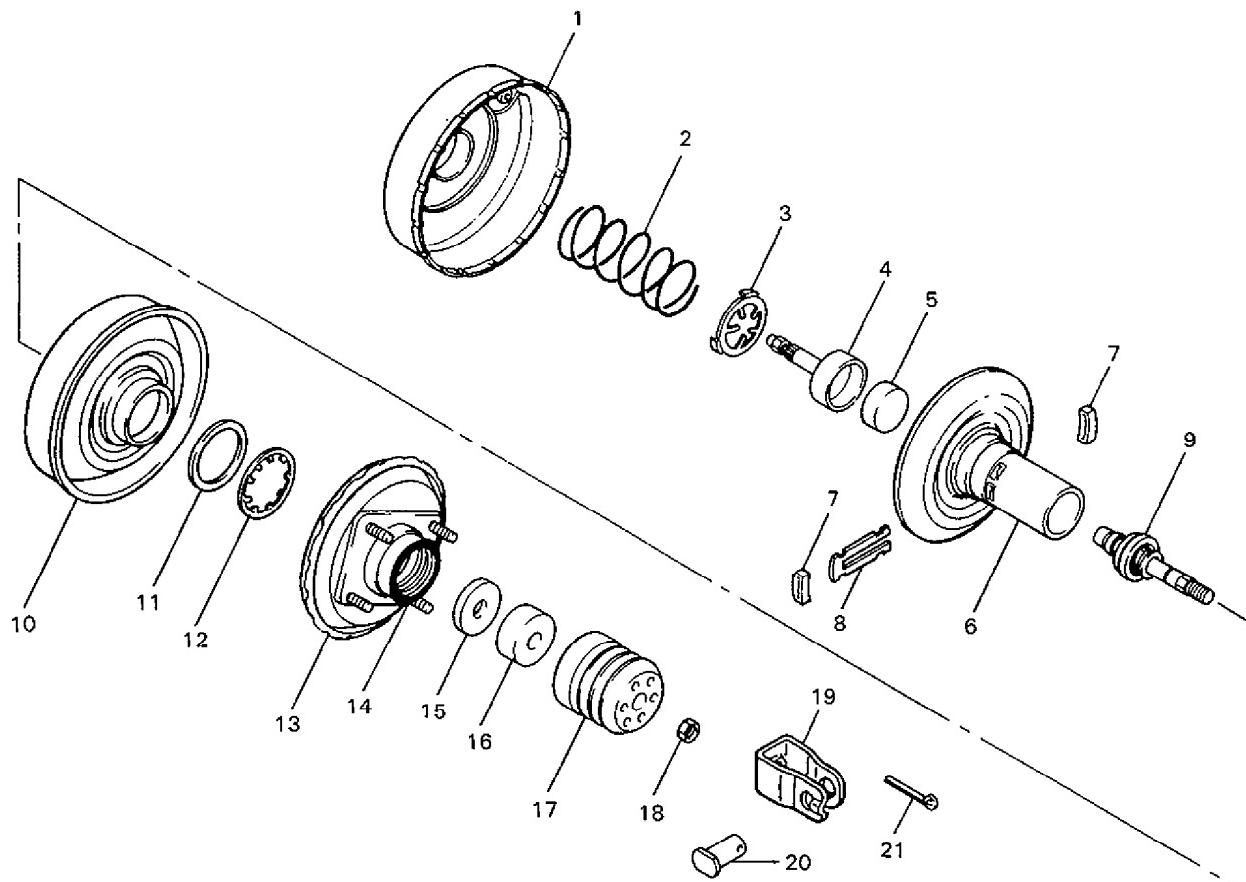
Front brake	Rear brake
10000 kPa	9500–10000 kPa
100 kg/cm ²	95–100 kg/cm ²
1422 psi	1350 – 1422 psi

Special tool

(A): 09956-02210

- 6) Upon completion of fluid pressure test, bleed brake system and perform brake test.

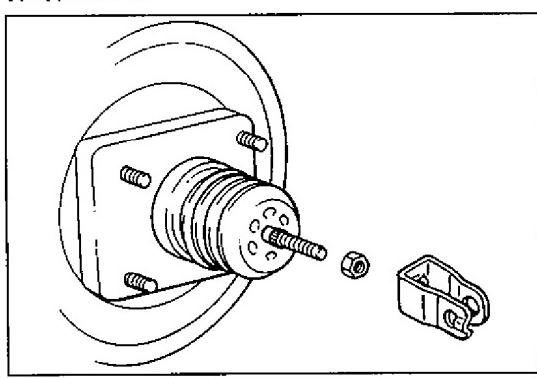
BRAKE BOOSTER REPAIR



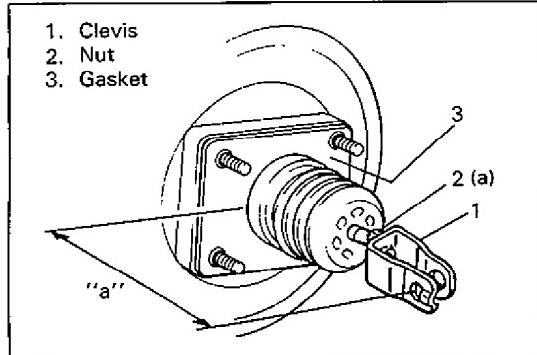
- 60A50-5-22-1S
- 1. Clevis
 - 2. Nut
 - 3. Gasket

NOTE:

The 8 in. brake booster push rod clevis used for this model differs from the 7 in. one in shape and adjustment value. As the rest of the service procedures are the same, refer to service manual mentioned in the FOREWORD in this manual when servicing.



60A50-5-22-4S



60A50-5-22-5\$

Length

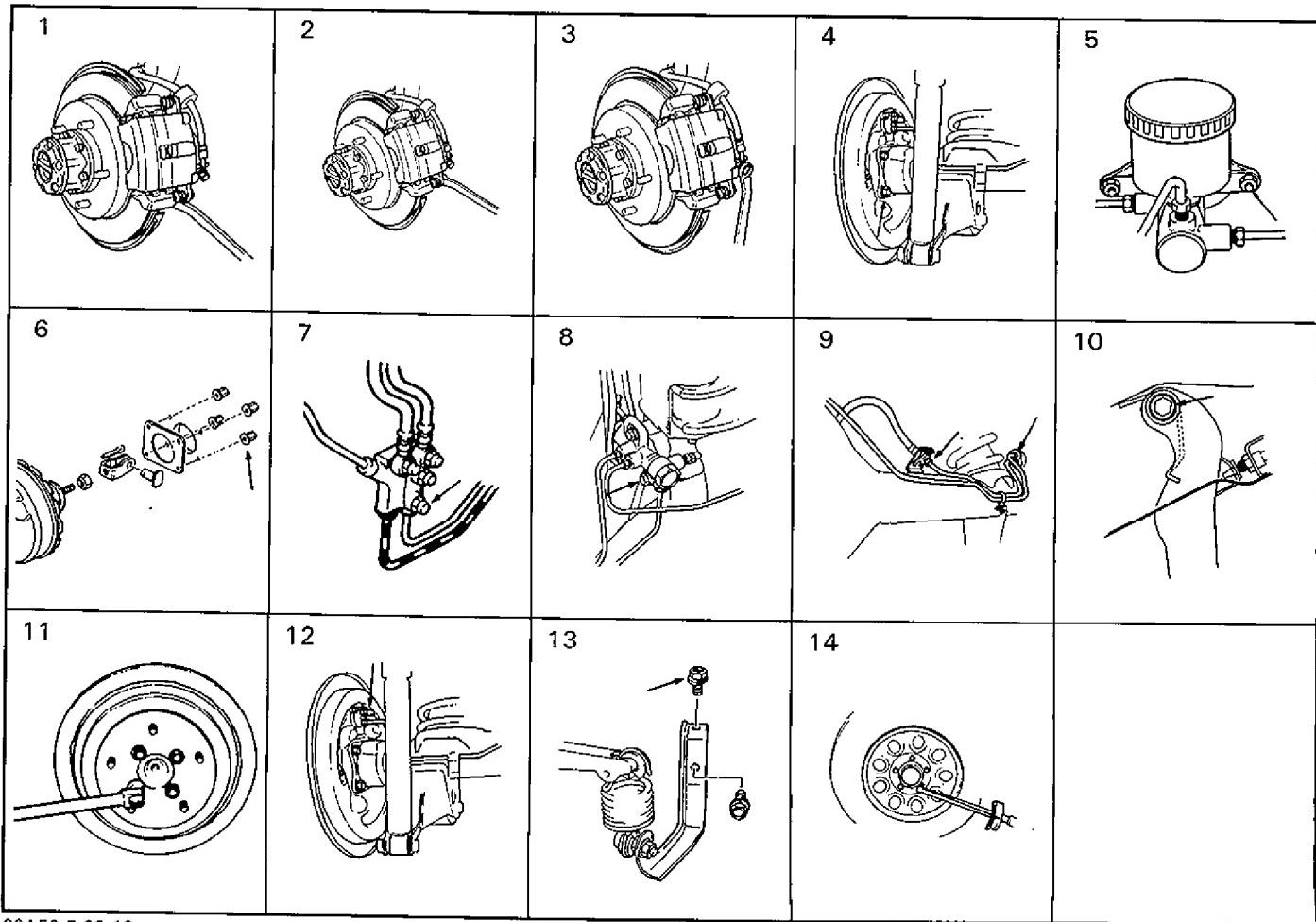
"a": 126.1–127.1 mm (4.96–5.00 in.)

Tightening torque

(a): 20–30 N·m (2.0–3.0 kg-m, 14.5–21.5 lb-ft)

RECOMMENDED TORQUE SPECIFICATIONS

Fastening part	Tightening torque		
	N·m	kg-m	lb-ft
1. Brake caliper carrier bolt	70–100	7.0–10.0	51.0–72.0
2. Brake caliper pin bolt	22–32	2.2–3.2	16.0–23.0
3. Front brake flexible hose bolt	20–25	2.0–2.5	14.5–18.0
4. Rear brake nut (Brake back plate nut)	18–28	1.8–2.8	13.5–20.0
5. Master cylinder nut	10–16	1.0–1.6	7.5–11.5
6. Booster nut	10–16	1.0–1.6	7.5–11.5
7. Brake pipe 5-way joint bolt	8–12	0.8–1.2	6.0–8.5
8. LSP valve bolt	18–28	1.8–2.8	13.5–20.0
9. Brake pipe flare nut	14–18	1.4–1.8	10.5–13.0
10. Brake pedal shaft nut	18–28	1.8–2.8	13.5–20.0
11. Rear brake drum nut	50–80	5.0–8.0	36.5–57.5
12. Brake bleeder plug	(Front caliper)	9–10	0.9–1.0
	(Rear cylinder)	9–10	0.9–1.0
	(LSPV)	10–13	1.0–1.3
13. Brake LSPV stay bolt	18–28	1.8–2.8	13.5–20.0
14. Wheel nut	80–110	8.0–11.0	58.0–79.5



SECTION 6

ENGINE

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ENGINE CHARGING SYSTEM	
ENGINE EMISSION CONTROLS	6J-1
ENGINE EXHAUST	6K-1

60A50-6-1-1S

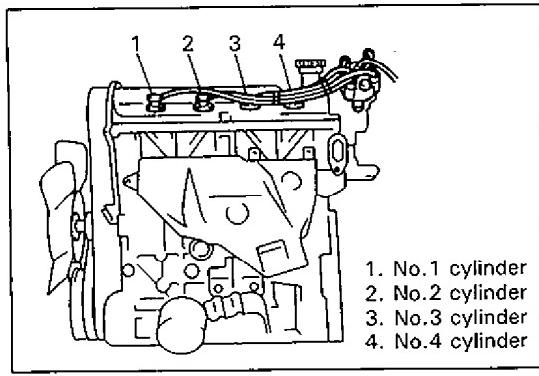
GENERAL INFORMATION

STATEMENT OF CLEANLINESS AND CARE

An automobile engine is a combination of many machined, honed, polished and lapped surfaces with tolerances that are measured in the thousands of a millimeter (ten thousands of inch). Accordingly, when any internal engine parts are serviced, care and cleanliness are important. Throughout this section, it should be understood that proper cleaning and protection of machined surfaces and friction areas is part of the repair procedure. This is considered standard shop practice even if not specifically stated.

- A liberal coating of engine oil should be applied to friction areas during assembly to protect and lubricate the surfaces on initial operation.
- Whenever valve train components, pistons, piston rings, connecting rods, rod bearings, and crank-shaft journal bearings are removed for service, they should be retained in order.
At the time of installation, they should be installed in the same locations and with the same mating surfaces as when removed.
- Battery cables should be disconnected before any major work is performed on the engine. Failure to disconnect cables may result in damage to wire harness or other electrical parts.

60A50-6-1-2S



60A50-6-2-1S

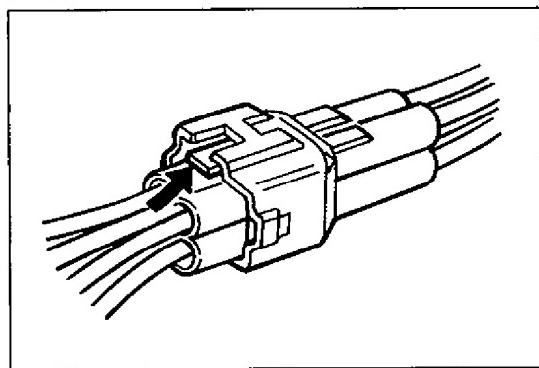
- Throughout this manual, the four cylinders of the engine are identified by numbers; No. 1, No. 2, No. 3 and No. 4 as counted from crankshaft pulley side to flywheel side.

GENERAL INFORMATION ON ENGINE SERVICE

ENGINE FOLLOWING INFORMATION ON ENGINE SERVICE SHOULD BE NOTED CAREFULLY, AS IT IS IMPORTANT IN PREVENTING DAMAGE, AND IN CONTRIBUTING TO RELIABLE ENGINE PERFORMANCE.

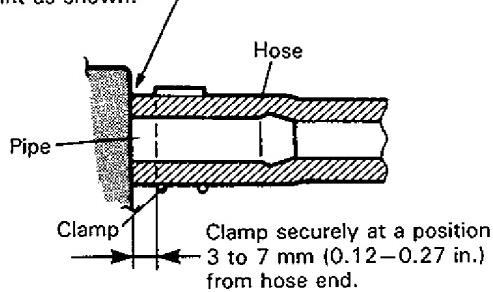
- When raising or supporting engine for any reason, do not use a jack under oil pan. Due to small clearance between oil pan and oil pump strainer, jacking against oil pan may cause it to be bent against strainer resulting in damaged oil pick-up unit.
- It should be kept in mind, while working on engine, that 12-volt electrical system is capable of violent and damaging short circuits. When performing any work where electrical terminals could possibly be grounded, ground cable of the battery should be disconnected at battery.
- Any time the air cleaner, air intake pipe, throttle body or intake manifold is removed, the intake opening should be covered. This will protect against accidental entrance of foreign material which could follow intake passage into cylinder and cause extensive damage when engine is started.
- When disconnecting couplers, don't pull wire harness but make sure to hold coupler itself. With lock type coupler, be sure to unlock before disconnection. Attempt to disconnect coupler without unlocking may result in damage to coupler. When connecting lock type coupler, insert it till clicking sound is heard and connect it securely.

60A50-6-2-2S

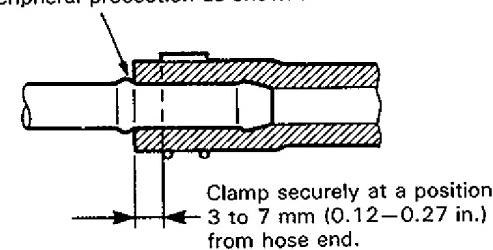


60A50-6-2-4S

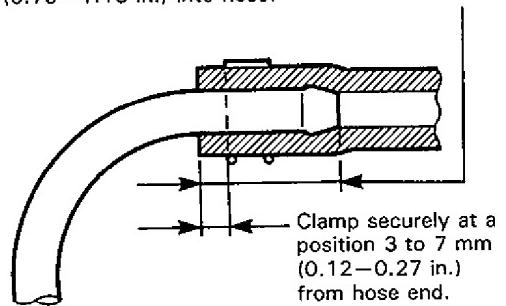
With short pipe, fit hose as far as it reaches pipe joint as shown.



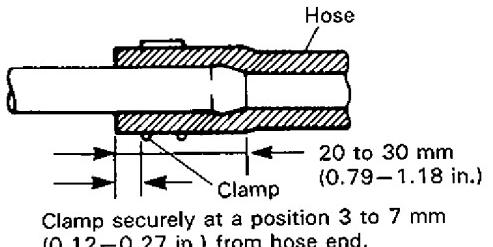
With following type pipe, fit hose as far as its peripheral proection as shown.



With bent pipe, fit hose as far as its bent part as shown or till pipe is about 20–30 mm (0.79–1.18 in.) into hose.

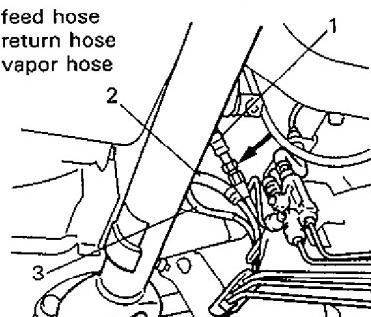


With straight pipe, fit hose till pipe is about 20 to 30 mm (0.79–1.18 in.) the hose.



60A50-6-3-1S

1. Fuel feed hose
2. Fuel return hose
3. Fuel vapor hose



60A50-6-3-5S

PRECAUTION ON FUEL SYSTEM SERVICE

- Work must be done with no smoking, in a well-ventilated area and away from any open flames.
- As fuel feed line (between fuel pump and fuel pressure regulator) is still under high fuel pressure even after engine was stopped, loosening or disconnecting fuel feed line directly may cause dangerous spout of fuel to occur where loosened or disconnected.

Before loosening or disconnecting fuel feed line, make sure to release fuel pressure according to "FUEL PRESSURE RELIEF PROCEDURE".

A small amount of fuel may be released after fuel line is disconnected.

In order to reduce the chance of personal injury, cover fitting to be disconnected with a shop cloth. Put that cloth in an approved container when disconnection is completed.

- Never run engine with fuel pump relay disconnected when engine and exhaust system are hot.
- Fuel or fuel vapor hose connection varies with each type of pipe. When reconnecting fuel or fuel vapor hose, be sure to connect and clamp each hose correctly referring to figure "Hose Connection".

After connecting, make sure that it has no twist or kink.

- When installing fuel filter union bolt or plug bolt on union bolt, always use new gasket and tighten it to specified torque. See Section 6C for specified torque.
- When installing injector, fuel feed pipe or fuel pressure regulator, lubricate its O-ring with spindle oil or gasoline.

- When connecting fuel pipe flare nut, first tighten flare nut by hand and then tighten it to specified torque, using back-up wrench.

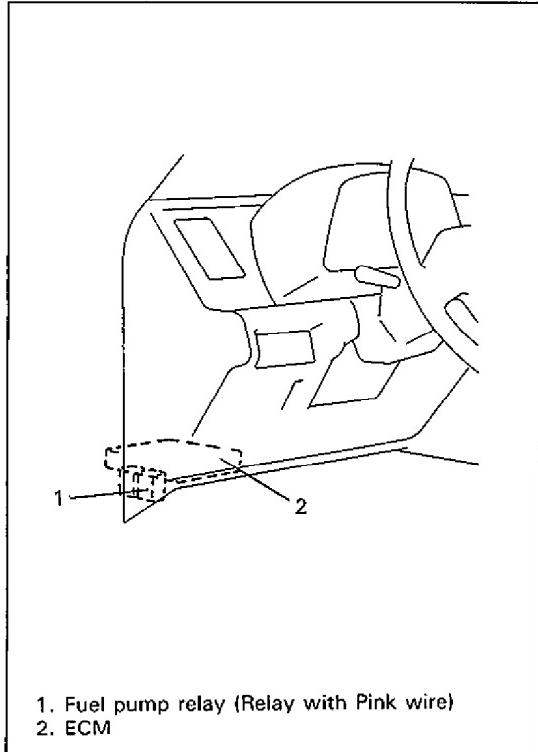
FUEL PRESSURE RELIEF PROCEDURE

CAUTION:

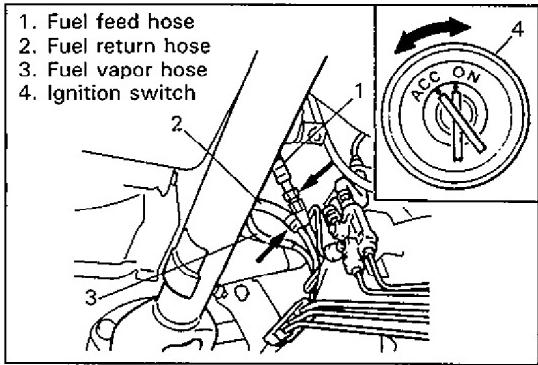
This work must not be done when engine is hot. If done so, it may cause adverse effect to catalyst.

After making sure that engine is cold, release fuel pressure as follows.

60A50-6-4-1S



60A50-6-4-2S



60A50-6-4-4S

FUEL LEAKAGE CHECK PROCEDURE

After performing any service on fuel system, check to make sur that there are no fuel leakages as follows.

1. Turn ON ignition switch for 2 seconds (to operate fuel pump) and then turn it OFF. Repeat this (ON and OFF) 3 or 4 times and apply fuel pressure to fuel line (till fuel pressure is felt by hand placed on fuel return hose).
2. In this state, check to see that there are no fuel leakages from any part of fuel system.

ENGINE DIAGNOSIS

Condition	Possible Cause	Correction
Hard starting (Engine cranks OK)	<p>Ignition system out of order.</p> <ul style="list-style-type: none"> • Blown fuse • Faulty spark plug • Leaky high-tension cord • Loose connection or disconnection of high-tension cords or lead wires • Cracked rotor or cap in distributor • Faulty ignition coil • Faulty noise suppressor • Faulty CAS (in distributor) • Faulty igniter (power unit) • Improper ignition timing • Faulty ECM <p>Fuel system out of order.</p> <ul style="list-style-type: none"> • Lack of fuel in fuel tank • Dirty fuel filter • Dirty or clogged fuel hose or pipe • Malfunctioning fuel pump • Air inhaling from air intake system <p>Electronic Fuel Injection system out of order.</p> <p>Low compression.</p> <ul style="list-style-type: none"> • Poor spark plug tightening or faulty gasket • Incorrect valve lash • Compression leak from valve seat • Sticky valve stem • Weak or damaged valve springs • Compression leak at cylinder head gasket • Sticking or damaged piston ring • Worn piston, ring or cylinder <p>Others</p> <ul style="list-style-type: none"> • Broken valve timing belt • Malfunctioning PCV valve • Loose connection or disconnection of vacuum hoses 	<p>Repair or replace.</p> <p>Clean and adjust plug gap or replace.</p> <p>Replace.</p> <p>Repair or replace.</p> <p>Replace.</p> <p>Replace.</p> <p>Replace.</p> <p>Replace.</p> <p>Replace.</p> <p>Adjust.</p> <p>Replace.</p> <p>Refill.</p> <p>Replace.</p> <p>Clean.</p> <p>Replace.</p> <p>Repair or replace.</p> <p>Refer to SECTION 6E1.</p> <p>Tighten to specified torque or replace gasket.</p> <p>Adjust.</p> <p>Remove cylinder head and lap valves.</p> <p>Correct or replace valve and valve guide.</p> <p>Replace valve springs.</p> <p>Repair or replace.</p> <p>Replace piston rings.</p> <p>Replace ring and piston. Rebore or replace cylinder.</p> <p>Replace.</p> <p>Replace.</p> <p>Connect securely.</p>

Condition	Possible Cause	Correction
Engine has no power	<p>Ignition system out of order.</p> <ul style="list-style-type: none"> • Incorrect ignition timing • Defective spark plug • Worn distributor terminals • Leaks, loose connection or disconnection of high-tension cord • Faulty ESA system <p>Engine overheating.</p> <p>Fuel system out of order.</p> <ul style="list-style-type: none"> • Clogged fuel hose or pipe • Dirty or clogged fuel filter • Clogged air cleaner element • Air inhaling from air intake system <p>Electronic Fuel Injection system out of order.</p> <p>Low compression.</p> <p>Others</p> <ul style="list-style-type: none"> • Loose connection or disconnection of vacuum hoses • Malfunctioning EGR valve (if equipped) • Dragging brakes • Slipping clutch 	<p>Adjust.</p> <p>Adjust or replace.</p> <p>Dress or replace. Also check rotor.</p> <p>Connect or replace as necessary.</p> <p>Refer to SECTION 6F1.</p> <p>Refer to "Overheating" section.</p> <p>Clean.</p> <p>Replace.</p> <p>Clean or replace.</p> <p>Repair or replace.</p> <p>Refer to SECTION 6E1.</p> <p>Previously outlined.</p> <p>Connect securely.</p> <p>Check and replace as necessary.</p> <p>Repair or replace.</p> <p>Adjust or replace.</p>
Improper engine idling or engine fails to idle	<p>Ignition system out of order.</p> <ul style="list-style-type: none"> • Faulty spark plug • Leaky or disconnected high-tension cord • Worn distributor terminals • Improper ignition timing • Cracked cap in distributor with leakage occurring inside • Faulty ESA system <p>Fuel system out of order.</p> <ul style="list-style-type: none"> • Shortage of fuel in fuel tank • Clogged air cleaner element • Leaky manifold, throttle body, or cylinder head gasket <p>Engine overheating.</p> <p>Electronic Fuel Injection system out of order.</p> <p>Low compression</p> <p>Others</p> <ul style="list-style-type: none"> • Loose connection or disconnection of vacuum hoses • Malfunctioning EGR valve (if equipped) • Malfunctioning PCV valve 	<p>Adjust or replace.</p> <p>Connect or replace.</p> <p>Replace.</p> <p>Adjust.</p> <p>Replace.</p> <p>Refer to SECTION 6F1.</p> <p>Refill.</p> <p>Clean or replace.</p> <p>Replace.</p> <p>Refer to "Overheating" section.</p> <p>Refer to SECTION 6E1.</p> <p>Previously outlined.</p> <p>Connect.</p> <p>Check and replace as necessary.</p> <p>Check and replace as necessary.</p>

Condition	Possible Cause	Correction
Engine hesitates (Momentary lack of response as the accelerator is depressed. Can occur at all vehicle speed. Usually most severe when first trying to make the vehicle move, as from a stop sign.)	Ignition system out of order. <ul style="list-style-type: none"> • Improper ignition timing • Spark plug faulty or plug gap out of adjustment • Leaky high tension cord Fuel system out of order. <ul style="list-style-type: none"> • Clogged air cleaner element • Clogged fuel filter hose or pipe • Leaky manifold or throttle body gasket Engine overheating. Electronic Fuel Injection system out of order. Low compression Others <ul style="list-style-type: none"> • Malfunctioning EGR valve (if equipped) 	Adjust. Replace or adjust gap. Replace. Clean or replace. Clean or replace. Replace. Refer to "Overheating" section. Refer to SECTION 6E1. Previously outlined. Check and replace as necessary.
Surges (Engine power variation under steady throttle or cruise. Feels like vehicle speeds going up and down with no change in accelerator pedal.)	Ignition system out of order. <ul style="list-style-type: none"> • Improper ignition timing • Leaky or loosely connected high tension cord • Defective spark plug (excess carbon deposits, improper gap, and burned electrodes, etc.) • Cracked rotor or cap in distributor • Faulty ESA system Fuel system out of order. <ul style="list-style-type: none"> • Clogged fuel filter • Kinky or damaged fuel hose and lines Electronic Fuel Injection system out of order. Others <ul style="list-style-type: none"> • Leaky vacuum hoses • Malfunctioning EGR valve (if equipped) 	Adjust. Check and repair or replace. Check and clean, adjust or replace. Replace. Refer to SECTION 6F1. Replace. Check and replace as necessary. Refer to SECTION 6E1. Repair or replace. Check and replace as necessary.
Excessive detonation (Engine makes sharp metallic knocks that change with throttle opening. Sounds like popcorn popping.)	Engine overheating Ignition system out of order. <ul style="list-style-type: none"> • Faulty spark plug • Improper ignition timing • Loose connection of high tension cord 	Refer to "Overheating" section. Replace. Adjust. Connect securely.

Condition	Possible Cause	Correction
	<p>Fuel system out of order.</p> <ul style="list-style-type: none"> • Clogged fuel filter and fuel lines • Air inhaling from air intake system <p>Electronic Fuel Injection system out of order.</p> <p>Others</p> <ul style="list-style-type: none"> • Excessive combustion chamber deposits • Malfunctioning EGR valve (if equipped) 	Replace or clean. Repair or replace. Refer to SECTION 6E1. Remove carbon. Check and replace as necessary.
Overheating	<ul style="list-style-type: none"> • Insufficient coolant • Loose water pump belt • Inoperative thermostat • Poor water pump performance • Improper ignition timing • Clogged or leaky radiator • Improper engine oil grade • Clogged oil filter or oil strainer • Not enough oil • Poor oil pump performance • Oil leakage • Dragging brakes • Slipping clutch • Blown cylinder head gasket 	Replenish. Adjust. Replace. Replace. Adjust. Flush, repair or replace. Replace with proper grade oil. Replace or clean (oil strainer). Replenish. Repair or replace. Repair. Repair or replace. Adjust or replace. Replace.
Poor gasoline mileage.	<p>Fuel system out of order.</p> <ul style="list-style-type: none"> • Fuel leakage from fuel tank and lines • Clogged air cleaner element <p>Ignition system out of order.</p> <ul style="list-style-type: none"> • Improper ignition timing • Leaks or loose connection of high tension cord • Faulty spark plug (improper gap, heavy deposits, and burned electrodes, etc.) • Faulty ESA system <p>Electronic Fuel Injection system out of order.</p>	Repair or replace. Clean or replace. Adjust. Repair or replace. Clean, adjust or replace. Refer to SECTION 6F1. Refer to SECTION 6E1.

Condition	Possible Cause	Correction
	Low compression Others <ul style="list-style-type: none"> • Poor valve seating • Dragging brakes • Slipping clutch • Thermostat out of order • Improper tire pressure • Malfunctioning EGR valve (if equipped) 	Previously outlined. Repair or replace. Repair or replace. Adjust or replace. Replace. Adjust. Check and replace as necessary.
Excessive engine oil consumption	Oil leakage <ul style="list-style-type: none"> • Loose oil drain plug • Loose oil pan bolts • Deteriorated or broken oil pan sealant • Leaky crankshaft oil seals • Leaky cylinder head cover gasket • Improper tightening of oil filter • Loose oil pressure switch • Blown cylinder head gasket • Leaky camshaft oil seals Oil entering combustion chamber <ul style="list-style-type: none"> • Sticky piston ring • Worn piston and cylinder • Worn piston ring groove and ring • Improper location of piston ring gap • Worn or damaged valve stem seal • Worn valve stem 	Tighten. Tighten. Replace sealant. Replace. Replace. Tighten. Tighten. Replace. Replace.
Low oil pressure	<ul style="list-style-type: none"> • Improper oil viscosity • Malfunctioning oil pressure switch • Not enough oil • Clogged oil strainer • Functional deterioration of oil pump • Worn oil pump relief valve • Excessive clearance in various sliding parts 	Use oil of proper viscosity. Replace. Replenish. Clean. Replace. Replace. Replace worn parts.

Condition	Possible Cause	Correction
Engine noise Note: Before checking mechanical noise, make sure that: <ul style="list-style-type: none"> • Ignition timing is properly adjusted. • Specified spark plug is used. • Specified fuel is used. 	Valve noise <ul style="list-style-type: none"> • Improper valve lash • Worn valve stem and guide • Weak or broken valve spring • Warped or bent valve Piston, ring and cylinder noise. <ul style="list-style-type: none"> • Worn piston, ring and cylinder bore Connecting rod noise. <ul style="list-style-type: none"> • Worn rod bearing • Worn crank pin • Loose connecting rod nuts • Low oil pressure Crankshaft noise. <ul style="list-style-type: none"> • Low oil pressure • Worn bearing • Worn crankshaft journal • Loose bearing cap bolts • Excessive crankshaft thrust play 	Adjst. Replace. Replace. Replace. Rebore or replace cylinder. Replace piston and ring. Replace. Repair by grindinig or replace crankshaft. Tighten nuts to specification. Previously outlined. Previously outlined. Replace. Repair by grinding, or replace crankshaft. Tighten bolts to specification. Replace thrust bearing.

60A50-6-10-1S

SECTION 6A1

ENGINE MECHANICAL (1-CAM 16-VALVES)

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NOTE:

In this section, the following system and parts appear in some description or illustrations, but whether they are installed in the particular vehicle or not depends on specifications or models. Be sure to bear this in mind when performing inspection and service work.

- EGR system (EGR valve, EGR modulator, VSV and vacuum hoses)
- Oxygen sensor

For what each abbreviation stands for (i.e., full term), refer to SECTION 0A.

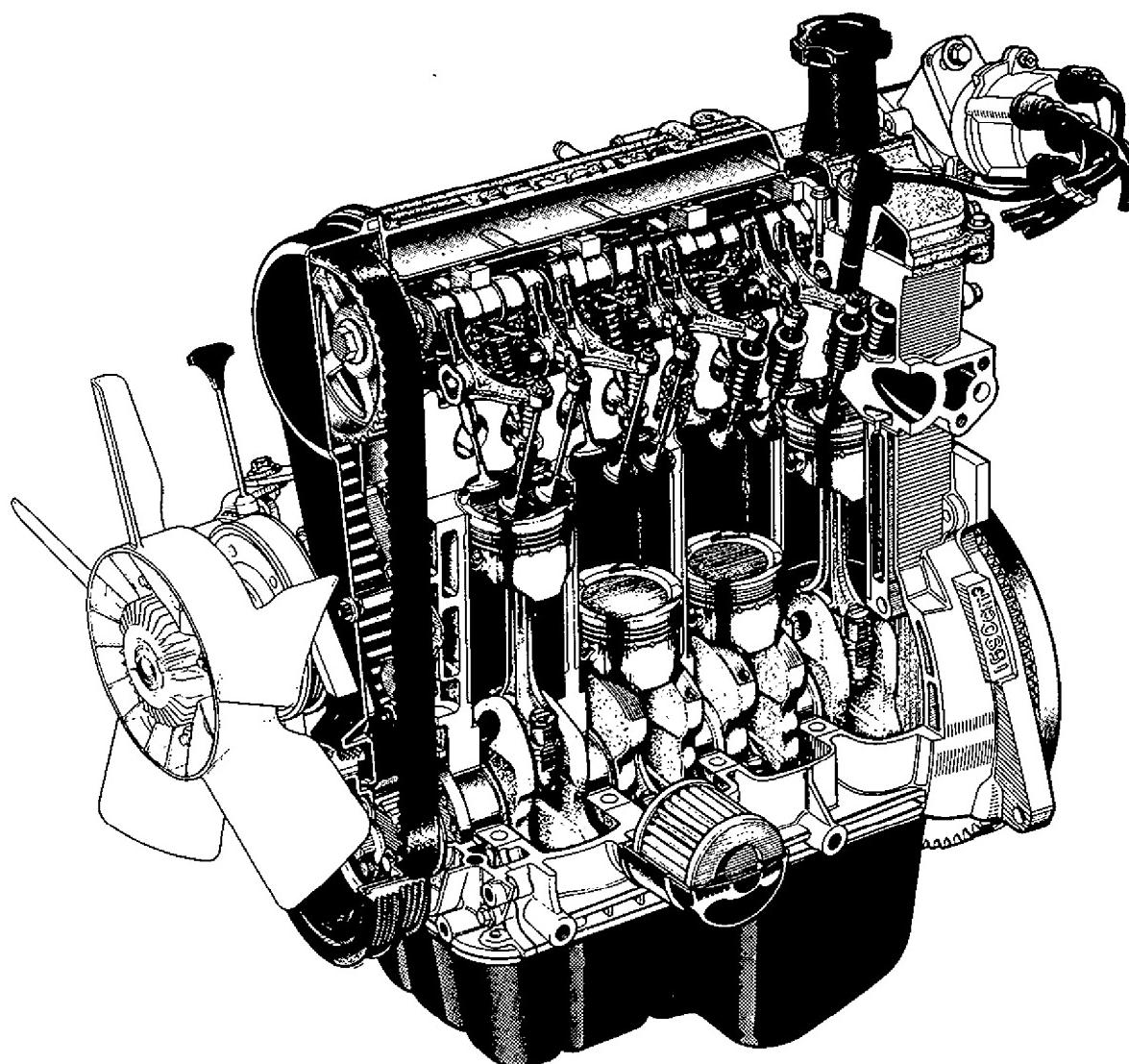
60A50-6A1-1-2S

GENERAL DESCRIPTION

ENGINE

The engine is a water-cooled, in line 4 cylinders, 4 stroke cycle gasoline unit equipped with its S.O.H.C. (Single Overhead Camshaft) valve mechanism arranged for "V"-type valve configuration and 16 valves (IN 2 and EX 2/one cylinder).

The single overhead camshaft is mounted over the cylinder head: it is driven from crankshaft through timing belt and opens and closes its valves via the rocker arms.



ENGINE LUBRICATION

The oil pump is of a trochoid type, and mounted on crankshaft at crankshaft pulley side.

Oil is drawn up through oil pump strainer and passed through pump to oil filter.

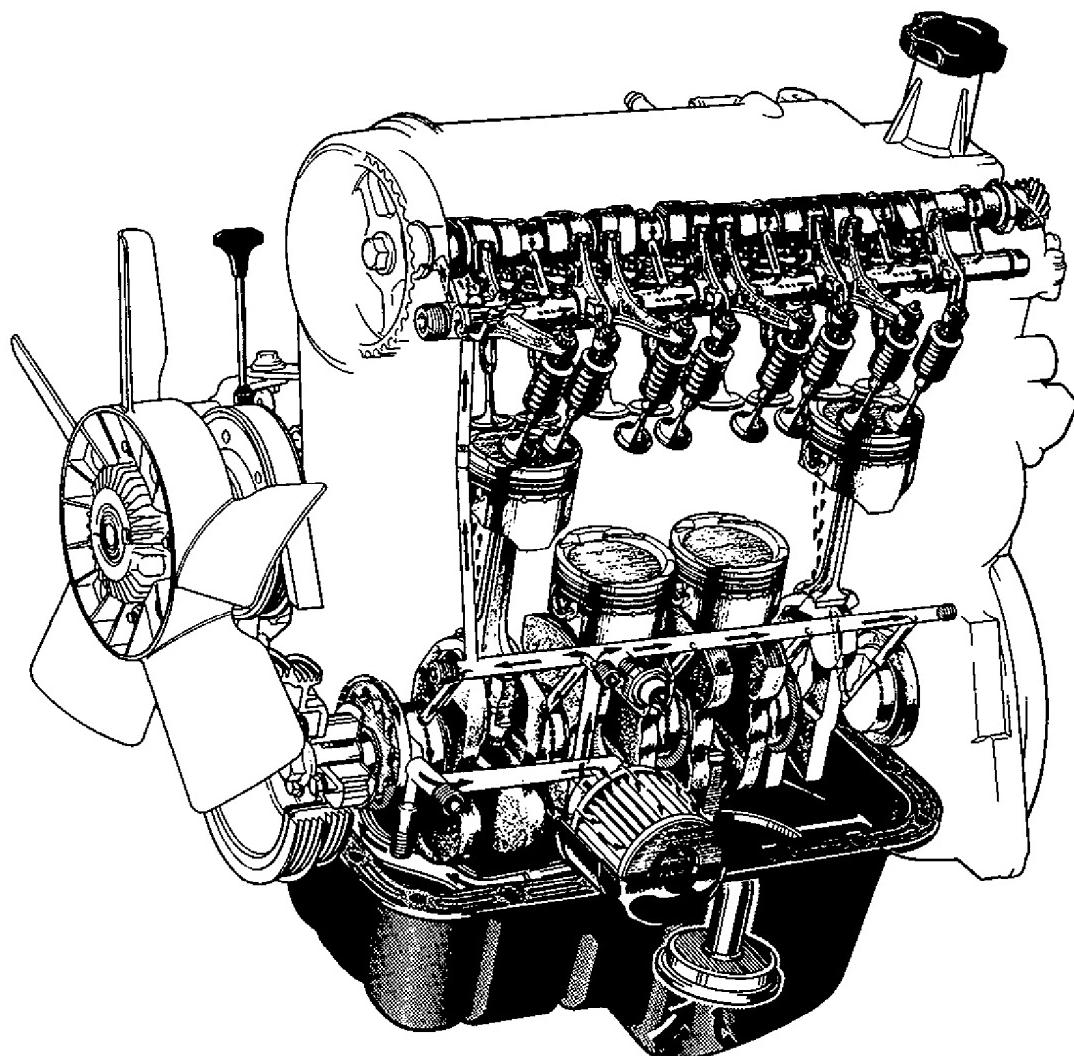
The filtered oil flows into two paths in cylinder block.

In one path, oil reaches crankshaft journal bearings.

Oil from crankshaft journal bearings is supplied to connecting rod bearings by means of intersecting passages drilled in crankshaft, and then injected from a small hole provided on big end of connecting rod to lubricate piston, rings, and cylinder wall.

In another path, oil goes up to cylinder head and lubricates camshaft journals, rocker arms, camshaft, etc., passing through oil gallery in rocker arm shaft.

An oil relief valve is provided on oil pump. This valve starts relieving oil pressure when the pressure comes over about 4.0 kg/cm^2 (56.9 psi, 400 kPa). Relieved oil drains back to oil pan.



CYLINDER BLOCK

The cylinder block is made of cast aluminum alloy and has 4 cylinders arranged "In-Line". A cylindrical cast iron sleeve is installed in each cylinder.

CRANKSHAFT AND MAIN BEARINGS

A monoblock casting crankshaft is supported by 5 main bearings which are of precision insert type. Four crank pins on the crankshaft are positioned 180° apart.

PISTONS, RINGS, PISTON PINS AND CONNECTING RODS

The piston is cast aluminum alloy, and has two compression rings and one oil ring.

Among two compression rings (top and 2nd rings), the outer surface of the top ring is treated with nitriding for improvement in abrasion resistance.

The oil ring consists of two rails and one spacer. The piston pin is offset 0.5 mm towards the major thrust side.

This allows a gradual change in thrust pressure against the cylinder wall as the piston travels its path.

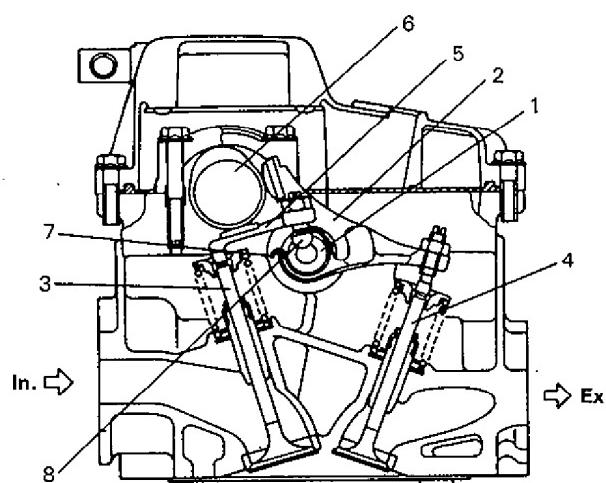
Pins, made of chromium steel, have a floating fit in the pistons and in the connecting rods. The connecting rods are made of forged steel, and the rod bearings are of precision insert type.

CYLINDER HEAD AND VALVE TRAIN

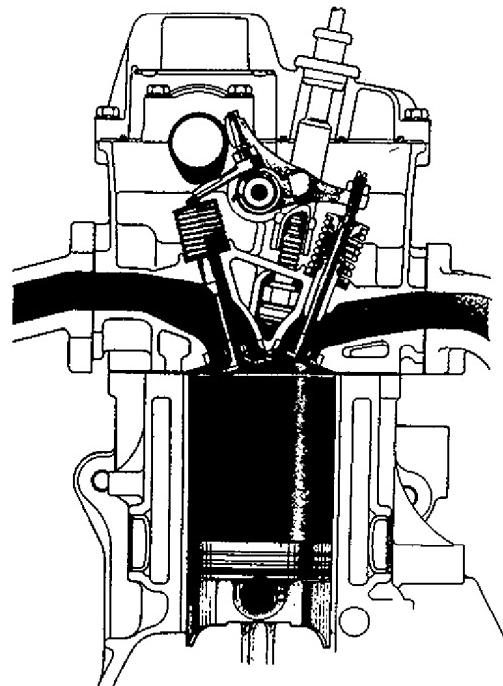
The cylinder head is made of aluminum casting. The supporting part of the camshaft is an independent cap type. The combustion chamber has 4 valves and uses the center plug type pent roof shape for higher intake and exhaust efficiency.

As the intake side rocker arm is end pivot type, it swings according to the camshaft movement to open and close the intake valve.

On the other hand, the exhaust side rocker arm is seesaw type. It swings with the rocker arm shaft as its supporting point and according to the camshaft movement to open and close the exhaust valve.



- | | |
|---------------------|--------------------|
| 1. Rocker arm shaft | 5. Rocker arm (IN) |
| 2. Rocker arm (EX) | 6. Camshaft |
| 3. Intake valve | 7. Clip |
| 4. Exhaust valve | 8. Pivot |



ON VEHICLE SERVICE

COMPRESSION CHECK

Check compression pressure on all four cylinders as follows:

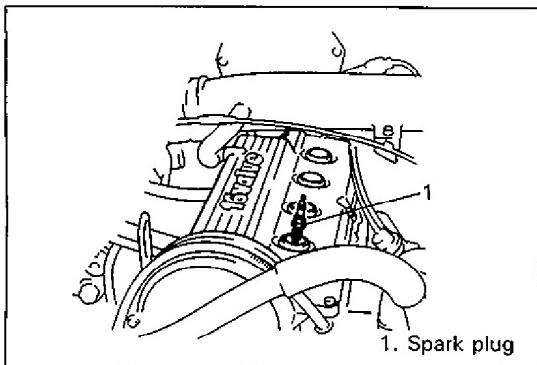
1. Warm up engine.
2. Stop engine after warming up.

NOTE:

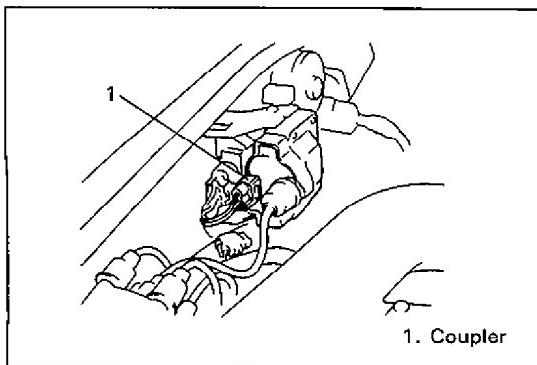
After warming up engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T model), and set parking brake and block drive wheels.

3. Remove all spark plugs.

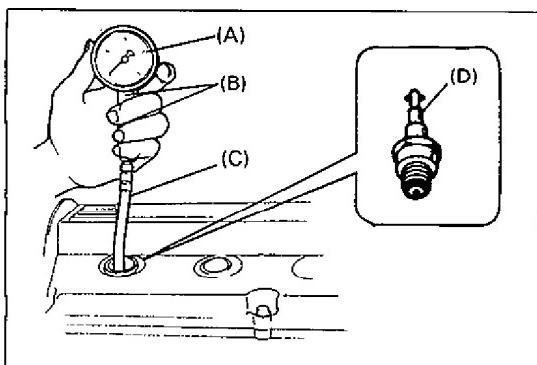
60A50-6A1-5-1S



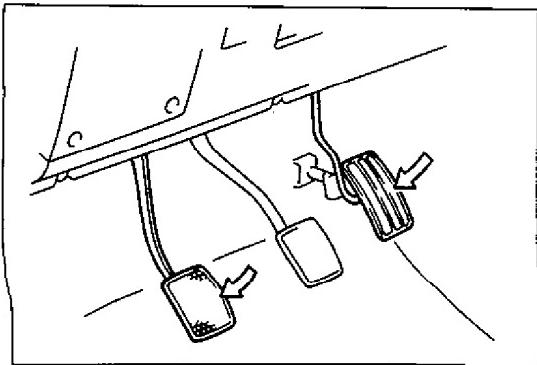
60A50-6A1-5-2S



60A50-6A1-5-3S



60A50-6A1-5-4S



4. Disconnect ignition coil wire harness at coupler.

WARNING:

Failure in disconnecting ignition coil coupler can cause spark to occur in engine room possibly resulting in a dangerous explosion.

5. Install special tool (Compression gauge) into spark plug hole.

Special Tool

- (A): 09915-64510-001
- (B): 09915-64510-002
- (C): 09915-64530
- (D): 09915-67010

6. Disengage clutch (to lighten starting load on engine) for M/T model, and depress accelerator pedal all the way to make throttle valve full-open.

60A50-6A1-5-5S

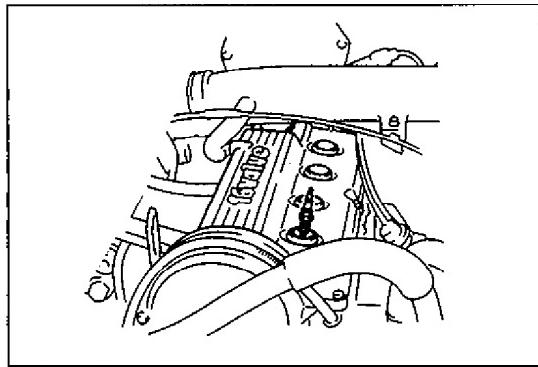
7. Crank engine with fully charged battery, and read the highest pressure on compression gauge.

NOTE:

For measuring compression pressure, crank engine at least 250 r/min. by using fully charged battery.

	Compression pressure
Standard	14.0 kg/cm ² (199.0 psi, 1400 kPa)
Limit	12.0 kg/cm ² (170.0 psi, 1200 kPa)
Max. difference between any two cylinders	1.0 kg/cm ² (14.2 psi, 100 kPa)

60A50-6A1-6-1S



60A50-6A1-6-3S

8. Carry out steps 5 through 7 on each cylinder to obtain four readings.
9. After checking, connect ignition coil coupler securely and install spark plugs.

ENGINE VACUUM CHECK

The engine vacuum that develops in the intake line is a good indicator of the condition of the engine. The vacuum checking procedure is as follows:

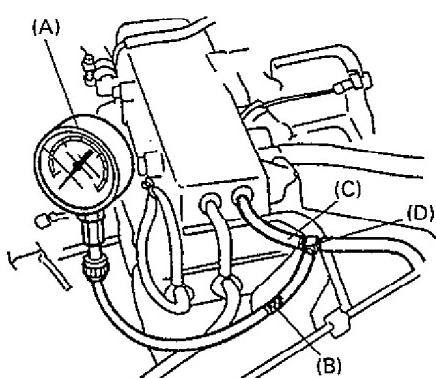
60A50-6A1-7-1S

1. Warm up engine to normal operating temperature.

NOTE:

After warming up engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T model), and set parking brake and block drive wheels.

60A50-6A1-7-2S



2. With engine stopped, disconnect fuel pressure regulator vacuum hose from intake surge tank and connect 3-way joint, hoses and special tool (vacuum gauge and joint) between intake surge tank and vacuum hose disconnected.

Special Tool

- (A): 09915-67310
 (B): 09918-08210

SUZUKI GENUINE PARTS

- (C): Hose 09343-03087
 (D): 3-way joint 09367-04002

3. Run engine at specified idle speed, and read vacuum gauge. Vacuum should be within following specification.

Vacuum specification (at sea level):

40—55 cmHg (15.7—21.6 in.Hg) at specified idling speed

60A50-6A1-7-3S

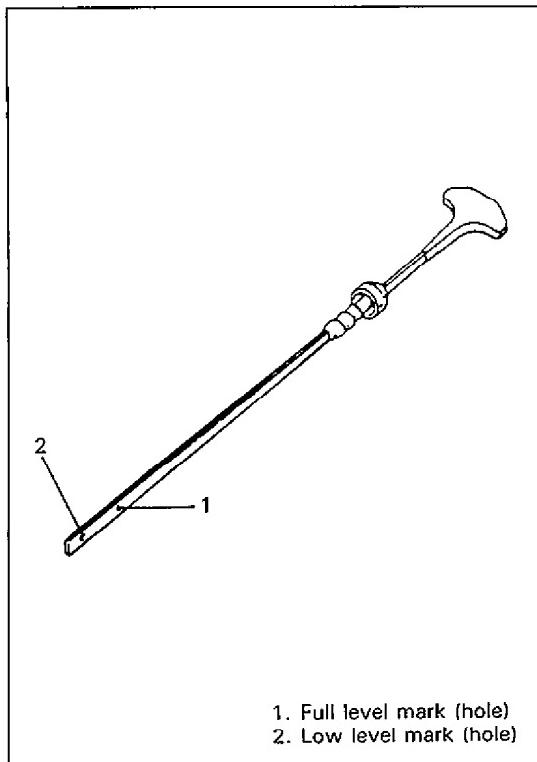
4. After checking, connect vacuum hose to intake surge tank.

OIL PRESSURE CHECK

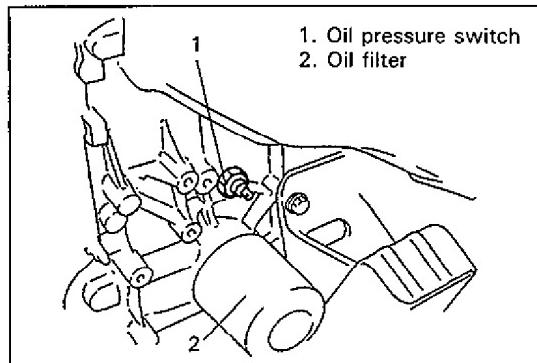
NOTE:

Prior to checking oil pressure, check following items.

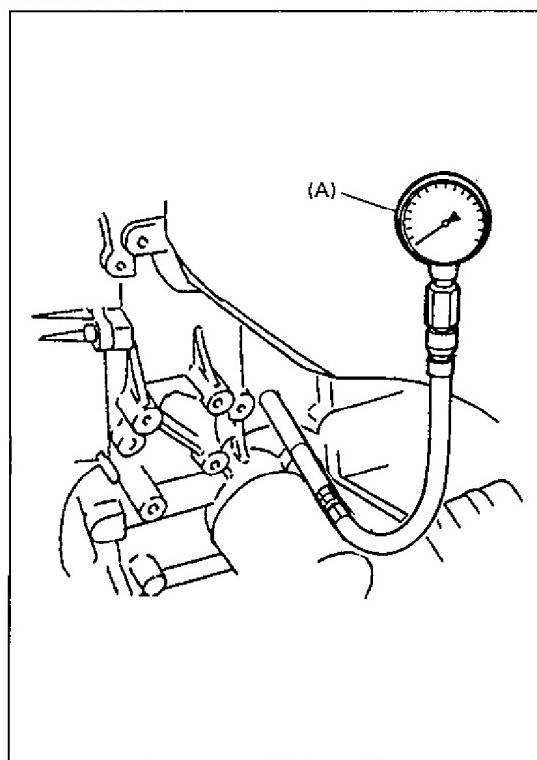
- Oil level in oil pan.
If oil level is low, add oil up to **Full level mark (hole)** on oil level gauge.
- Oil quality.
If oil is discolored, or deteriorated, change it.
For particular oil to be used, refer to the table in Section OB.
- Oil leaks.
If leak is found, repair it.



60A50-6A1-8-1S



60A50-6A1-8-3S



60A50-6A1-8-4S

1. Remove oil pressure switch from cylinder block.

2. Install special tool (Oil pressure gauge) to vacated threaded hole.

Special Tool

(A): 09915-77310

3. Start engine and warm it up to normal operating temperature.

NOTE:

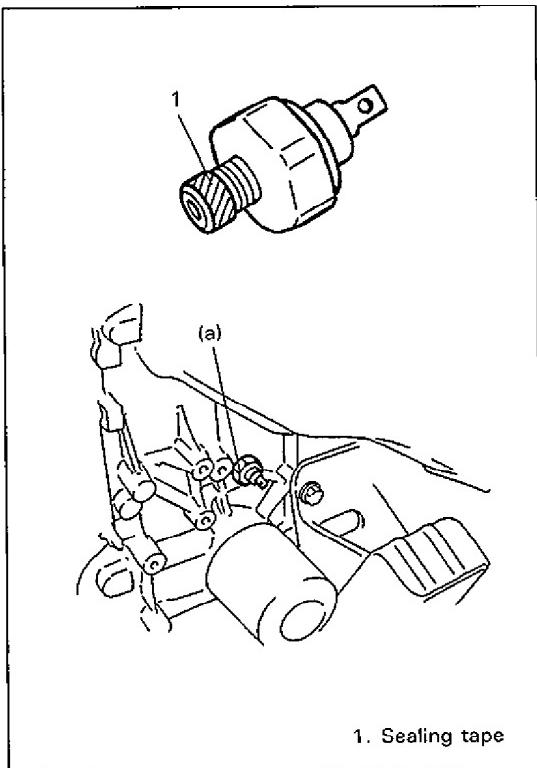
Be sure to place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T model), and set parking brake and block drive wheels.

4. After warming up, raise engine speed to 4,000 r/min and measure oil pressure.

Oil pressure specification:

$3.3\text{--}4.3 \text{ kg/cm}^2$ (46.9–61.1 psi) at 4,000 r/min (rpm)

5. Stop engine and remove oil pressure gauge.



60A50-6A1-9-1S

6. Before reinstalling oil pressure switch, be sure to wrap its screw threads with sealing tape and tighten switch to specified torque.

NOTE:

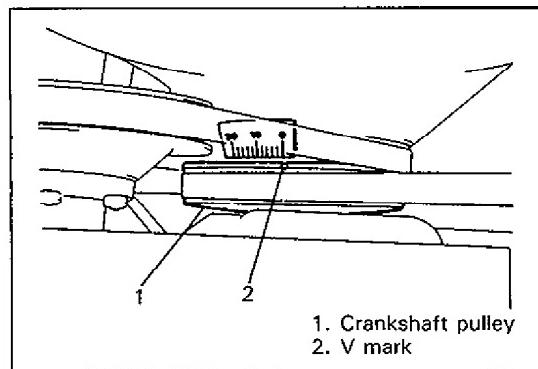
If sealing tape edge is bulged out from screw threads of switch, cut it off.

Tightening Torque

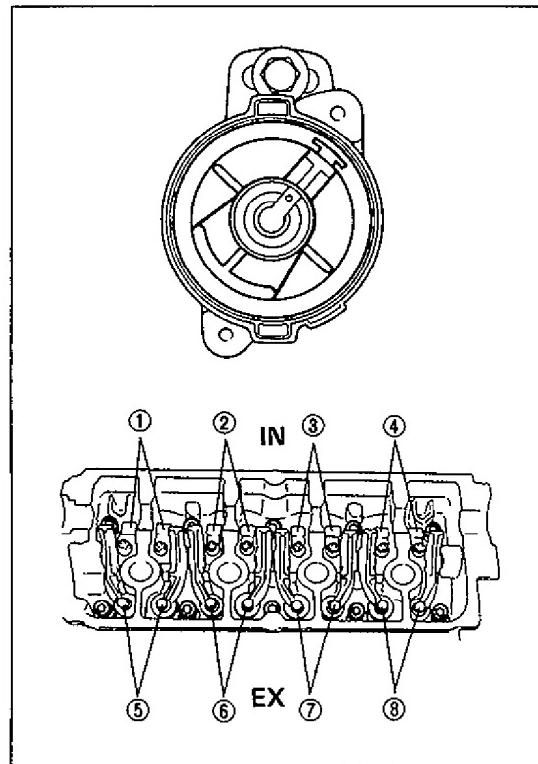
(a): 12–15 N·m (1.2–1.5 kg·m, 9.0–10.5 lb·ft)

7. Start engine and check oil pressure switch for oil leakage.

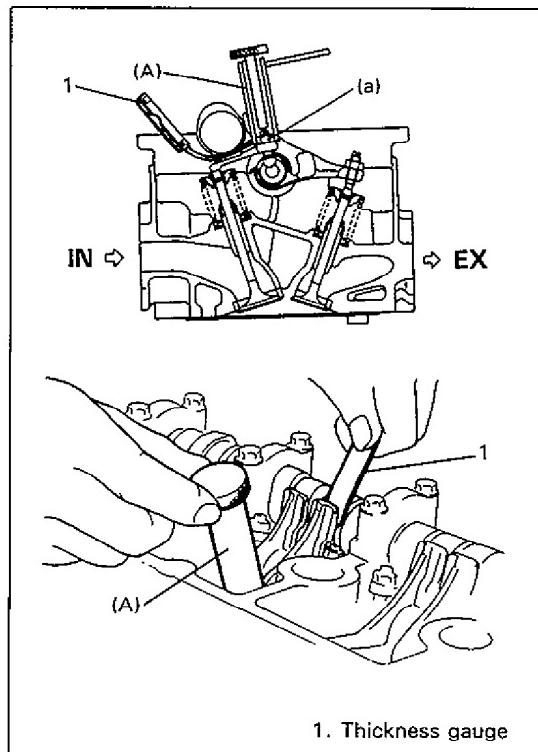
60A50-6A1-9-3S



60A50-6A1-10-1S



60A50-6A1-10-2S



60A50-6A1-10-4S

VALVE LASH (CLEARANCE)

1. Remove negative cable at battery.
2. Remove cylinder head cover referring to item "Cylinder Head cover" in Section 6A1.
3. Using 17 mm socket, turn crankshaft pulley clockwise until "V" mark (in white paint) on pulley aligns with "0" (zero) calibrated on timing belt cover.

4. Remove distributor cap and check rotor position. If it is positioned as shown in figure (i.e. No. 1 piston is at TDC of compression stroke), check valve lashes at valves ①, ②, ⑤ and ⑦. If it is at ignition position of No. 4 cylinder, check valve lashes at valves ③, ④, ⑥ and ⑧.

NOTE:

When checking valve clearance, insert thickness gauge between camshaft and cam-riding face of rocker arm.

5. If valve lash is out of specification, adjust it to specification by turning adjusting screw after loosening lock nut. After adjustment, tighten lock nut to specified torque while holding adjusting screw stationary, and then make sure again that valve lash is within specification.

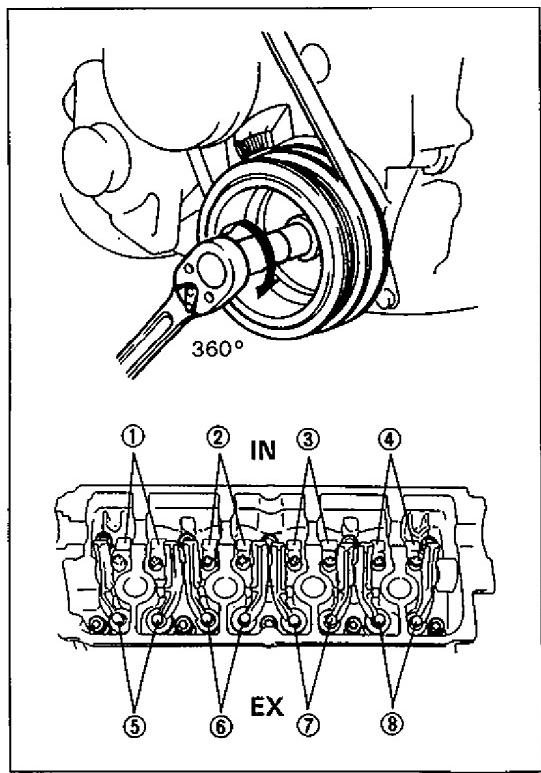
Valve clearance specification		When cold (Coolant temperature is 15–25°C or 59–77°F)	When hot (Coolant temperature is 60–68°C or 140–154°F)
		Intake	0.12–0.16 mm (0.0047–0.0063 in)
	Exhaust	0.08–0.12 mm (0.0031–0.0047 in)	0.12–0.16 mm (0.0047–0.0063 in)

Special Tool

(A): 09917-18210

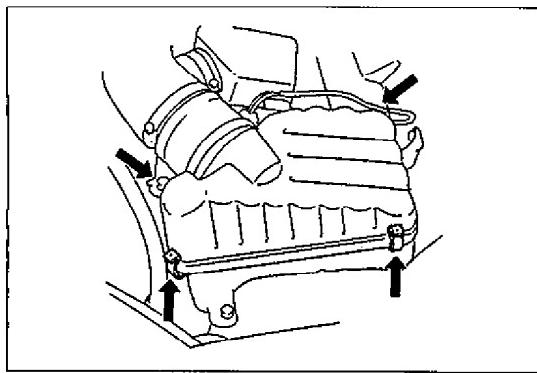
Tightening Torque

(a): 10–13 N·m (1.0–1.3 kg·m, 7.5–9.0 lb·ft)

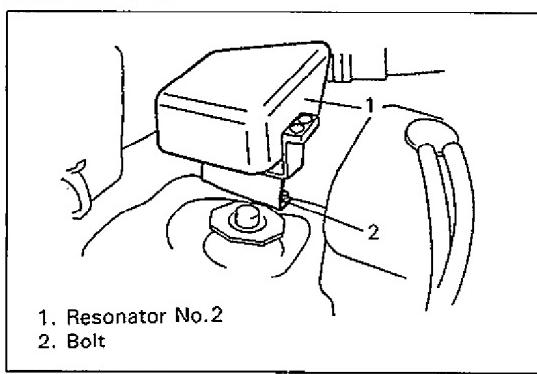


60A50-6A1-11-1S

6. After checking and adjusting valve lash at valves ①, ②, ⑤ and ⑦, (or ③, ④, ⑥ and ⑧) rotate crankshaft exactly one full turn (360°) and check the same at valves ③, ④, ⑥ and ⑧ (or ①, ②, ⑤ and ⑦). Adjust them as necessary.
7. After checking and adjusting all valves, reverse removal procedure for installation.



60A50-6A1-12-1S



60A50-6A1-12-2S

AIR CLEANER ELEMENT

REMOVAL

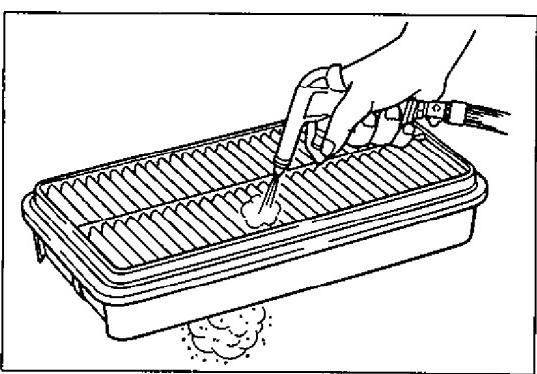
1. Unclamp 4 air cleaner case clamps.

2. Remove resonator No.2 bracket bolts. Then with air cleaner upper case loosened, remove air cleaner element.

INSPECT

Check air cleaner element for dirt. Replace excessively dirty element.

60A50-6A1-12-3S



60A50-6A1-12-4S

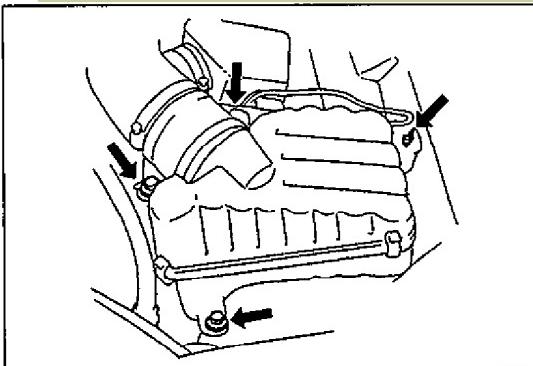
CLEAN

Blow off dust by compressed air from air outlet side of element.

INSTALLATION

Reverse removal procedure for installation.

60A50-6A1-12-5S

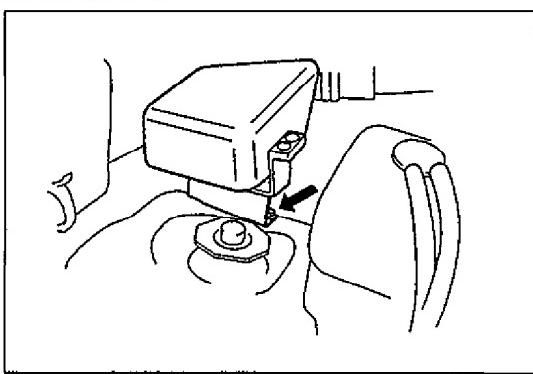


60A50-6A1-13-1S

AIR CLEANER ASSEMBLY

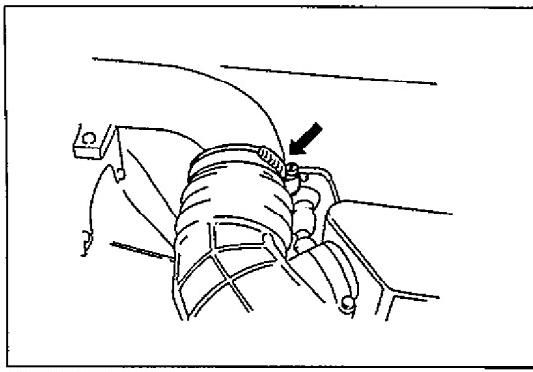
REMOVAL

1. Disconnect AFM coupler.
2. Remove air cleaner case bolts.



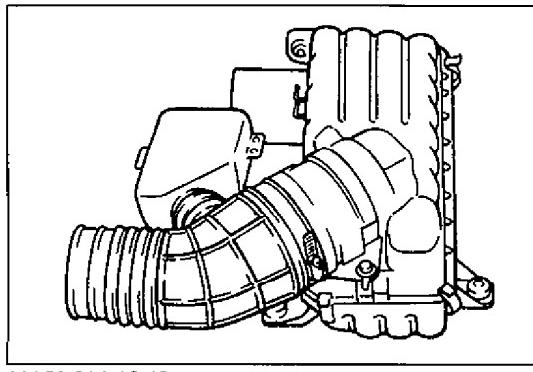
60A50-6A1-13-2S

3. Remove resonator No.2 bracket bolts.



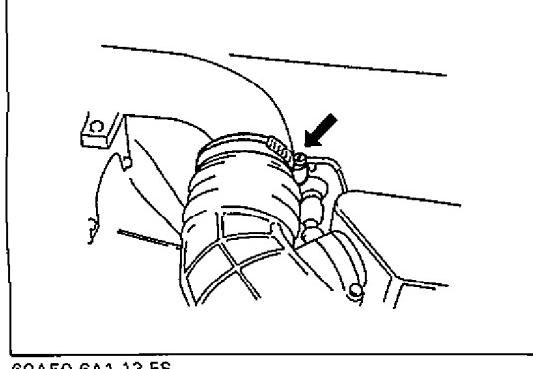
60A50-6A1-13-3S

4. Loosen air cleaner outlet hose clamp.



60A50-6A1-13-4S

5. Remove air cleaner assembly.



60A50-6A1-13-5S

INSTALLATION

Reverse removal procedure for installation, noting following.

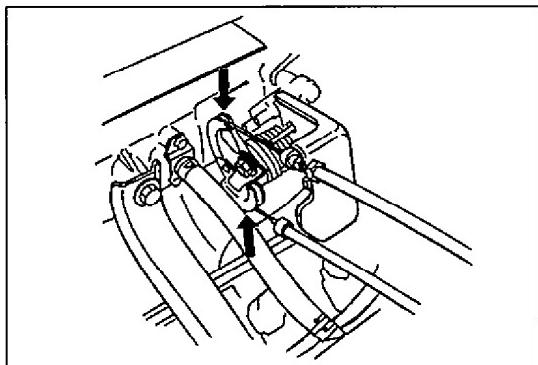
- Clamp air cleaner outlet hose securely.

CYLINDER HEAD COVER

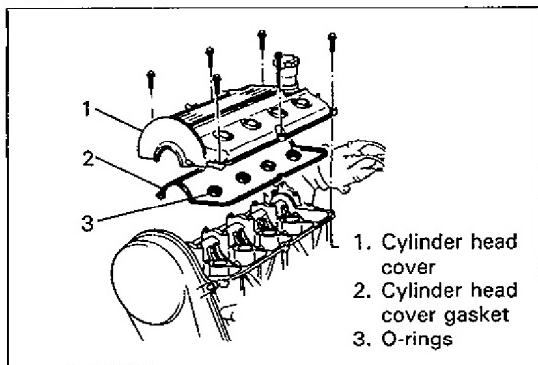
REMOVAL

1. Disconnect negative cable at battery.
2. Remove air intake pipe and its bracket.
3. Disconnect high-tension cords from spark plugs.

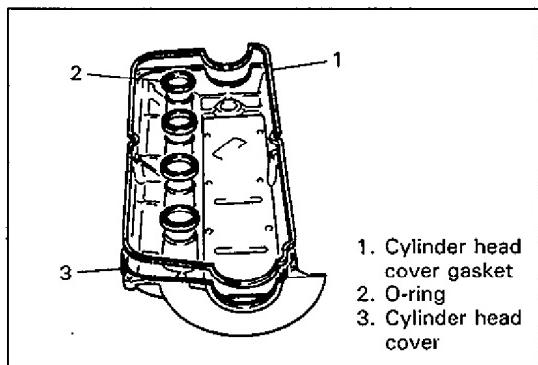
60A50-6A1-14-1S



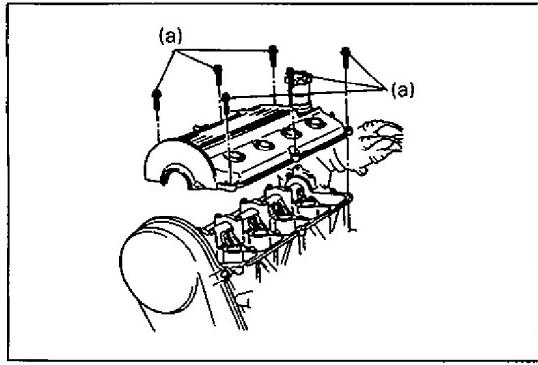
60A50-6A1-14-2S



60A50-6A1-14-3S



60A50-6A1-14-4S



4. Disconnect accelerator cable and A/T throttle cable (For A/T vehicle) from throttle body and PCV hose from head cover.

5. Remove cylinder head cover with cylinder head cover gasket and O-rings.

INSTALLATION

1. Install O-rings and cylinder head cover gasket to cylinder head cover.

NOTE:

Be sure to check each of these parts for deterioration or any damage before installation and replace if found defective.

2. Install cylinder head cover to cylinder head and tighten cover bolts to specified torque.

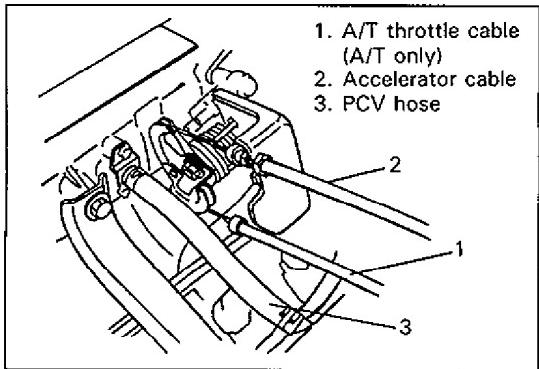
Tightening Torque

(a): 9–12 N·m (0.9–1.2 kg·m, 7.0–8.5 lb·ft)

NOTE:

When installing cylinder head cover, use care so that cylinder head cover gasket or O-rings will not get out of place or fall off.

60A50-6A1-14-5S



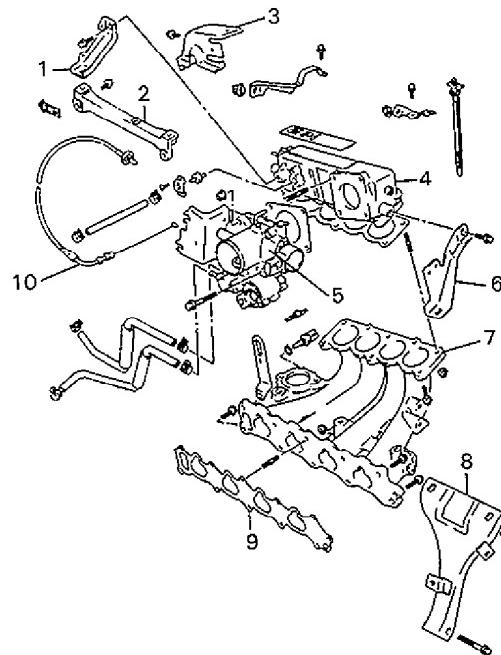
60A50-6A1-15-1S

3. Connect accelerator cable and A/T throttle cable (for A/T vehicle) to throttle body and then PCV hose to cover. Adjust accelerator cable play and A/T throttle cable play, referring to SECTION 6E1.

60A50-6A1-15-2S

4. Connect high-tension cords to spark plugs.
5. Install air intake pipe bracket and air intake pipe.
6. Connect negative cable at battery.

THROTTLE BODY AND INTAKE MANIFOLD



1. Intake manifold No.1 stiffener
2. Stiffener bracket
3. Throttle cover
4. Intake surge tank
5. Throttle body
6. No.2 stiffener
7. Intake manifold
8. Intake manifold stiffener
9. Gasket
10. Accelerator cable

60A50-6A1-16-1S

REMOVAL

1. Relieve fuel pressure according to procedure described in p. 6-4.
2. Disconnect negative cable at battery.

60A50-6A1-16-3S

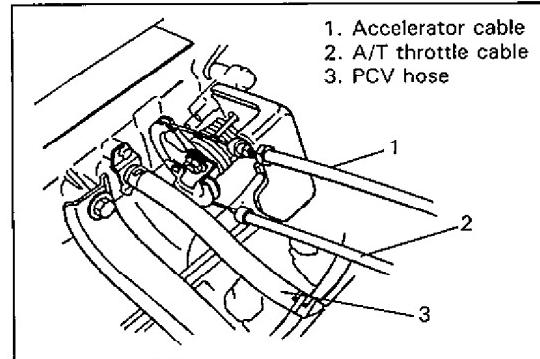
3. Drain cooling water.

WARNING:

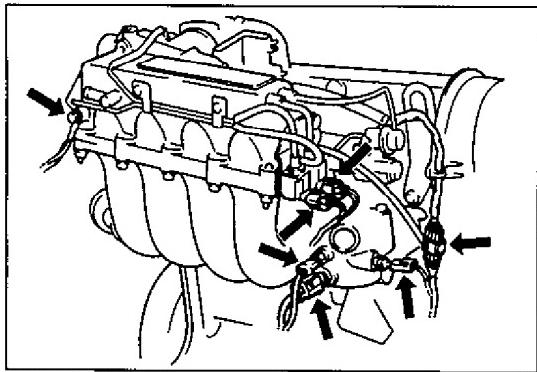
To help avoid danger of being burned, do not remove drain plug and radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if plug and cap are taken off too soon.

60A50-6A1-16-4S

4. Remove air intake pipe.
5. Disconnect accelerator cable and A/T throttle cable from throttle body, and PCV hose from PCV valve.



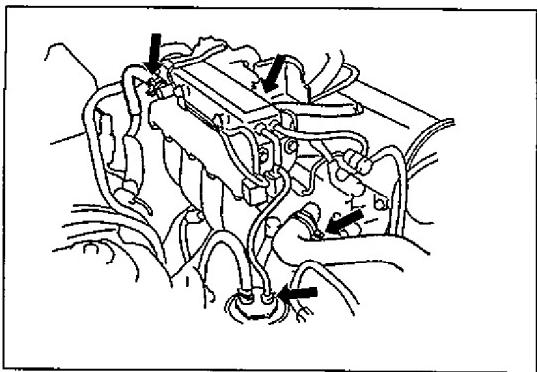
60A50-6A1-16-5S



60A50-6A1-17-1S

6. Disconnect following electric lead wires:

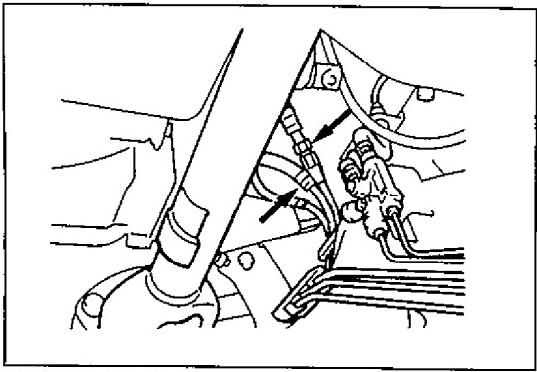
- EGR VSV (if equipped)
- Ground wires from intake surge tank
- Water temperature gauge
- Water temperature sensor
- Injectors, TPS and ISC solenoid valve lead wires at the coupler
- Canister purge VSV
- A/C water temperature switch (if equipped)



60A50-6A1-17-2S

7. Disconnect following hoses:

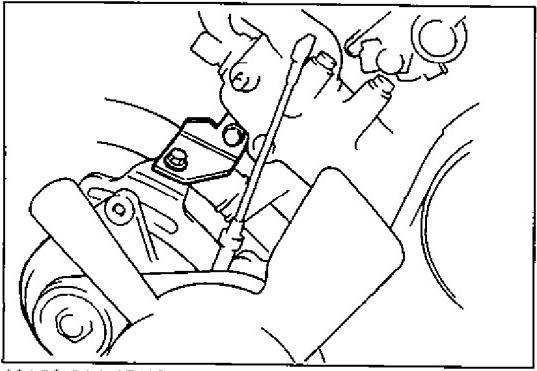
- PCV hose from PCV valve
- Brake booster hose from intake surge tank
- Canister purge hose from canister
- Engine cooling water hose (outlet side) from throttle body
- Radiator inlet hose from thermostat cap



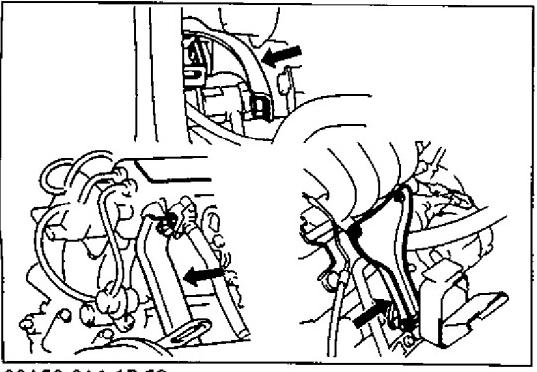
60A50-6A1-17-3S

8. Disconnect fuel feed hose joint. Use back-up wrench while loosening and tightening flare nut.

Disconnect fuel return hose from pipe.

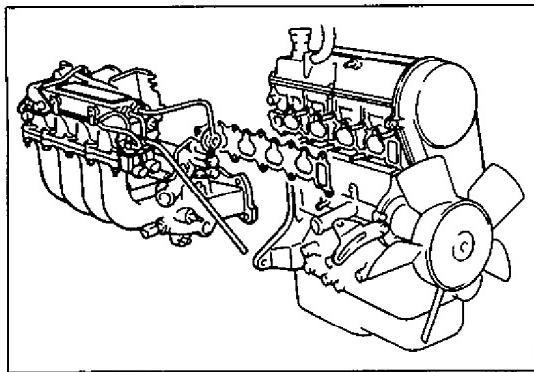


60A50-6A1-17-4S

9. Remove generator adjust arm stiffener.

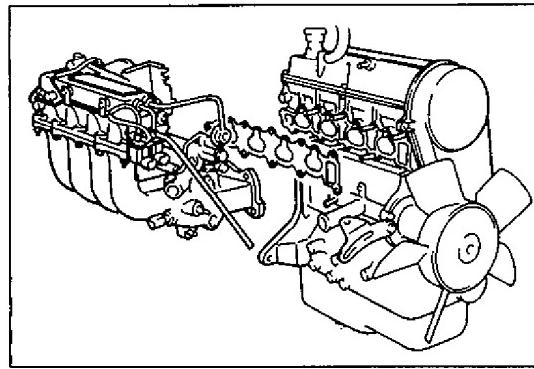
60A50-6A1-17-5S

10. Remove intake manifold stiffener, No.1 stiffener and No.2 stiffener with EGR modulator (if equipped).



60A50-6A1-18-1S

11. Remove intake manifold with surge tank and throttle body from cylinder head, and then its gasket.



60A50-6A1-18-3S

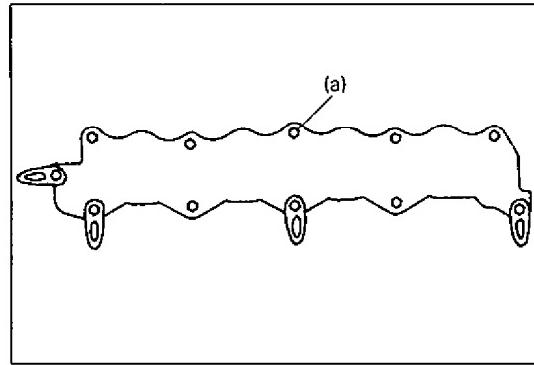
INSTALLATION

Reverse removal procedure for installation noting the followings.

- Use new intake manifold gasket.
- When installing intake manifold, install clamps at positions as shown in figure.

Tightening Torque

(a): 18–28 N·m (1.8–2.8 kg·m, 13.5–20.0 lb·ft)

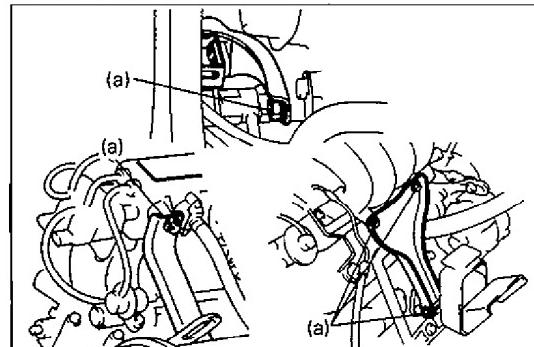


60A50-6A1-18-4S

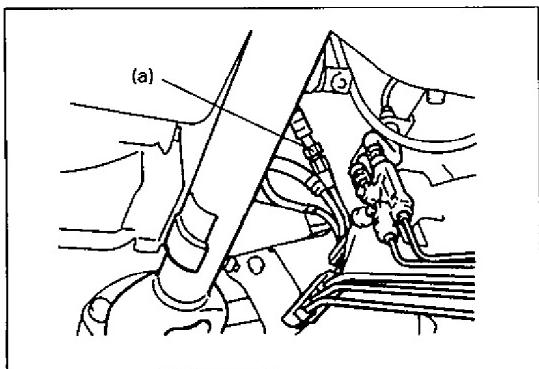
- Tighten stiffeners bolts to specified torque.

Tightening torque

(a): 40–60 N·m (4.0–6.0 kg·m, 29.0–43.0 lb·ft)



60A50-6A1-18-5S

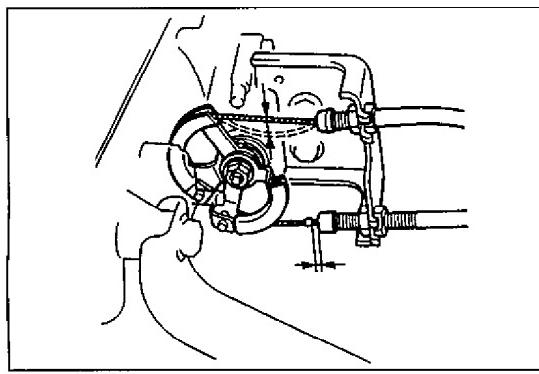


60A50-6A1-19-1S

- Tighten fuel feed pipe flare nut to specified torque. Be sure to use back-up wrench.

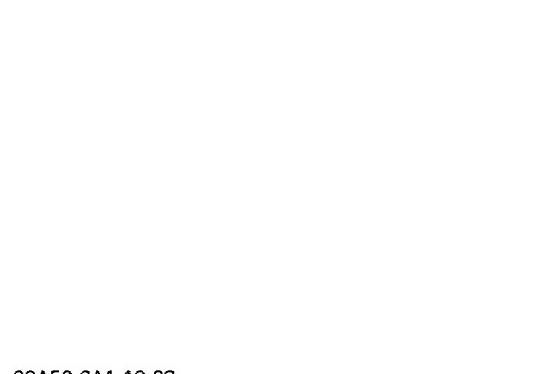
Tightening Torque

(a): 40–50 N·m (4.0–5.0 kg·m, 29.0–36.0 lb·ft)



60A50-6A1-19-2S

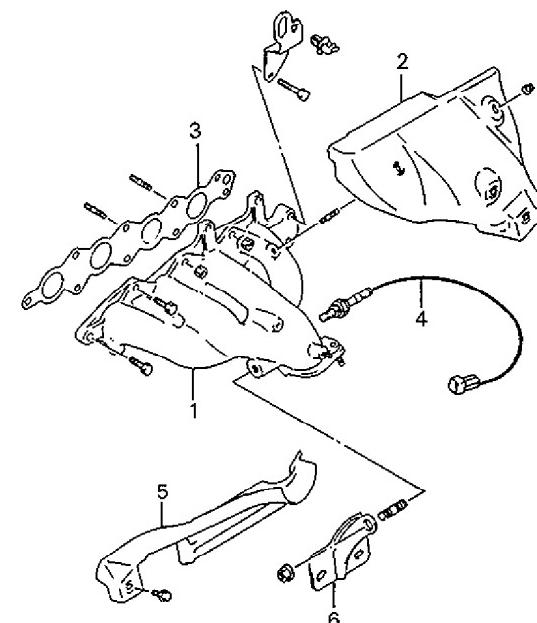
- Adjust accelerator cable play and A/T throttle cable play (A/T model), referring to Section 6E1.



60A50-6A1-19-3S

- Check to ensure that all removed parts are back in place. Reinstall any necessary parts which have not been reinstalled.
- Refill cooling system, referring to "ENGINE COOLING" section.
- Upon completion of installation, turn ignition switch ON but engine OFF and check for fuel leaks.
- Finally, start engine and check for engine cooling water leaks.

EXHAUST MANIFOLD



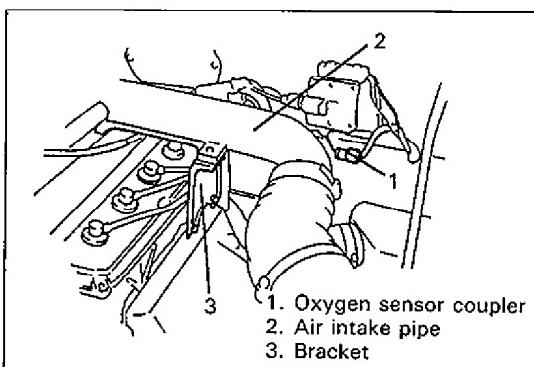
1. Exhaust manifold
2. Upper cover
3. Gasket
4. Oxygen sensor (if equipped)
5. Lower cover
6. Exhaust manifold stiffener

60A50-6A1-20-1S

WARNING:

To avoid danger of being burned, do not service exhaust system while it is still hot. Service should be performed after system cools down.

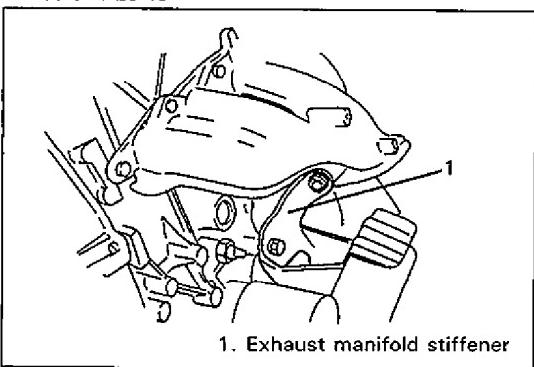
60A50-6A1-20-3S



REMOVAL

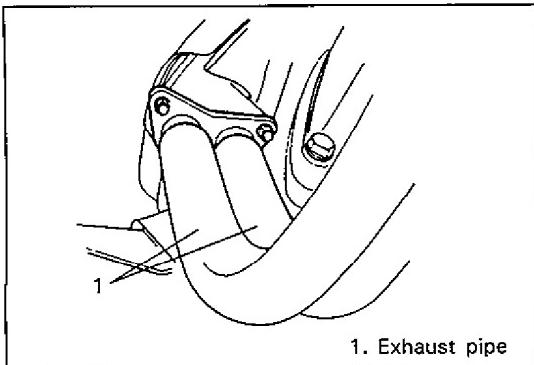
1. Disconnect negative cable at battery.
2. Disconnect oxygen sensor coupler if equipped.
3. Remove air intake pipe and its bracket.

60A50-6A1-20-4S



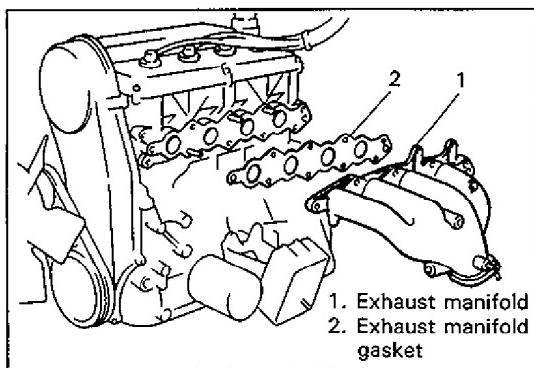
4. Remove upper cover of exhaust manifold.
5. Remove exhaust manifold stiffener.

60A50-6A1-20-5S



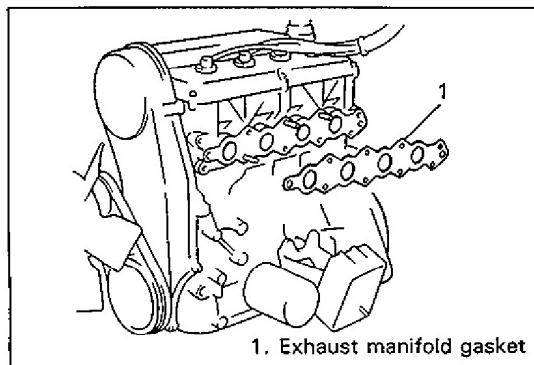
60A50-6A1-21-1S

6. Remove exhaust pipe from exhaust manifold.



60A50-6A1-21-2S

7. Remove exhaust manifold and its gasket from cylinder head.



60A50-6A1-21-3S

INSTALLATION

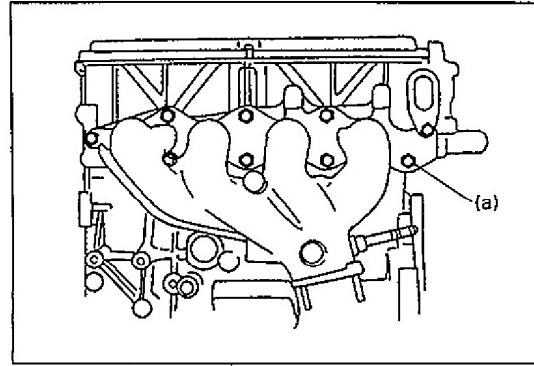
1. Install new gasket to cylinder head.

2. Install exhaust manifold.

Tighten manifold bolts and nuts to specified torque.

Tightening Torque

(a): 18–28 N·m (1.8–2.8 kg·m, 13.5–20.0 lb·ft)



60A50-6A1-21-4S

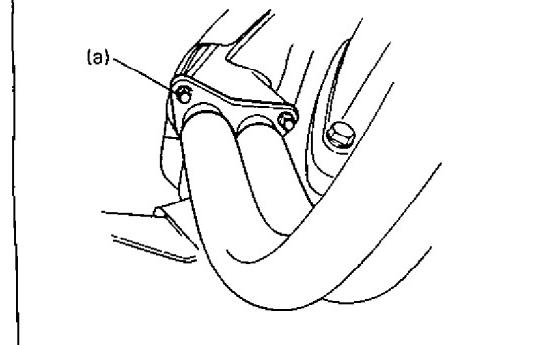
3. Install pipe gasket and install exhaust pipe to exhaust manifold.

Before installing pipe gasket, check it for deterioration or damage, and replace as necessary.

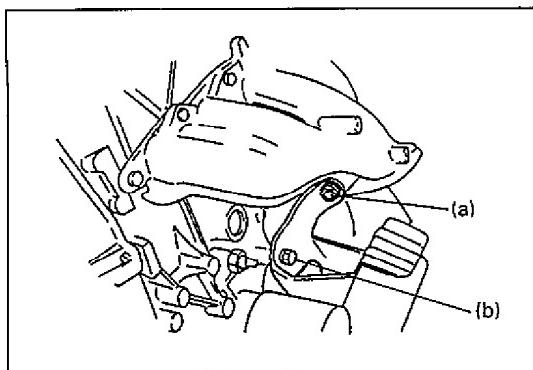
Tighten pipe nuts to specified torque.

Tightening Torque

(a): 40–60 N·m (4.0–6.0 kg·m, 29.0–43.0 lb·ft)



60A50-6A1-21-5S



60A50-6A1-22-1S

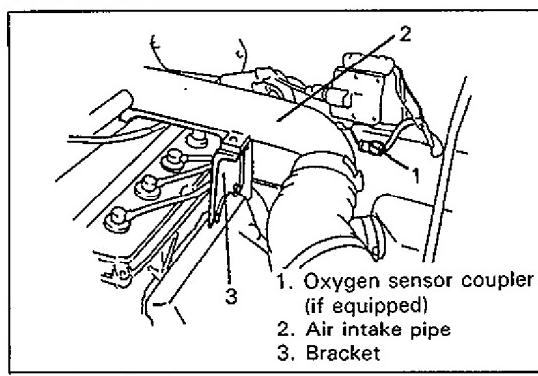
4. Install exhaust manifold stiffener.

Tighten exhaust manifold stiffener nut and bolts to specified torque.

Tightening Torque

(a): 40–60 N·m (4.0–6.0 kg·m, 29.0–43.0 lb·ft)

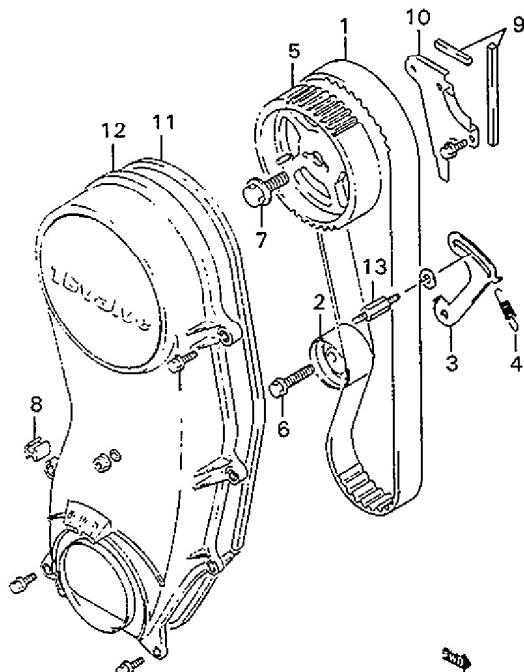
(b): 50–60 N·m (5.0–6.0 kg·m, 36.5–43.0 lb·ft)



60A50-6A1-22-2S

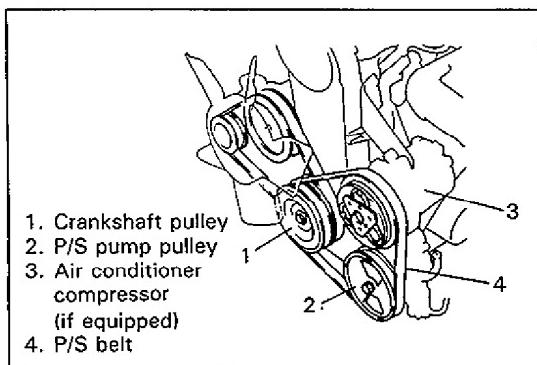
5. Install upper cover to exhaust manifold.**6. Install air intake pipe and its bracket.****7. Connect oxygen sensor coupler and clamp its wire securely, if equipped.****8. Connect negative cable at battery.****9. Check exhaust system for exhaust gas leakage.**

TIMING BELT AND BELT TENSIONER

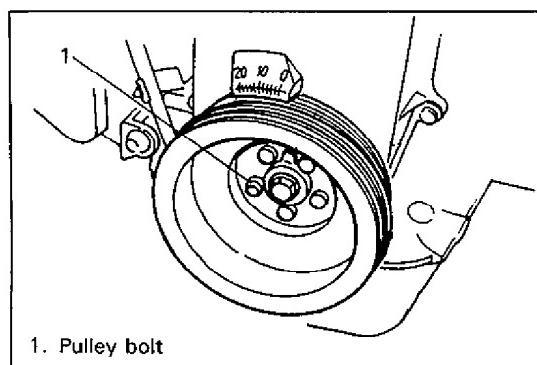


1. Timing belt
2. Tensioner
3. Tensioner plate
4. Tensioner spring
5. Camshaft timing pulley
6. Tensioner bolt
7. Pulley bolt
8. Seal
9. Inside cover seal
10. Inside cover
11. Outside cover seal
12. Outside cover
13. Tensioner stud

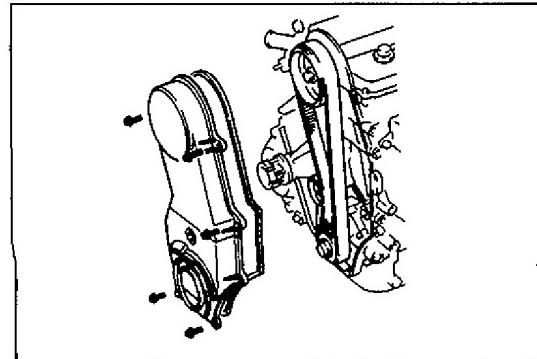
60A50-6A1-23-1S



60A50-6A1-23-3S



60A50-6A1-23-4S



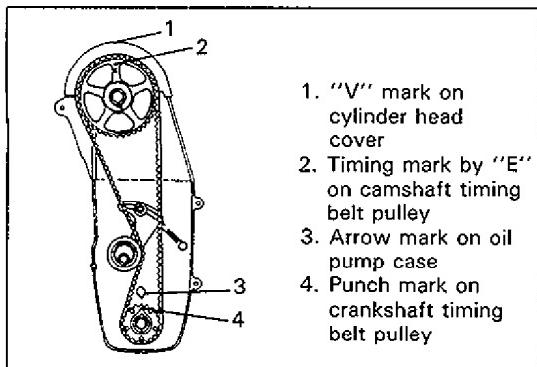
REMOVAL

1. Disconnect negative cable at battery.
2. Remove power steering pump belt or A/C compressor belt, if equipped.
3. Remove radiator cooling fan, water pump pulley, water pump drive belt and fan shroud.
If it is hard to remove fan shroud, drain engine cooling water and then disconnect radiator inlet hose from radiator.

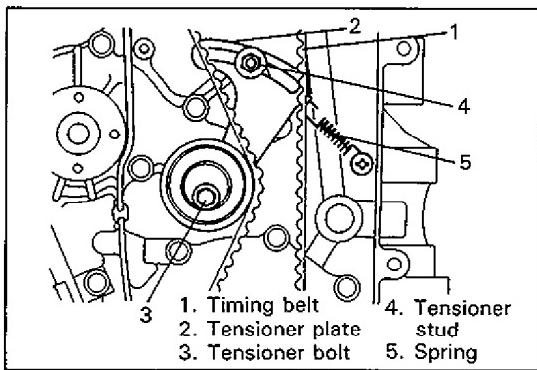
4. Remove crankshaft pulley by removing 5 pulley bolts.

5. Remove timing belt outside cover.

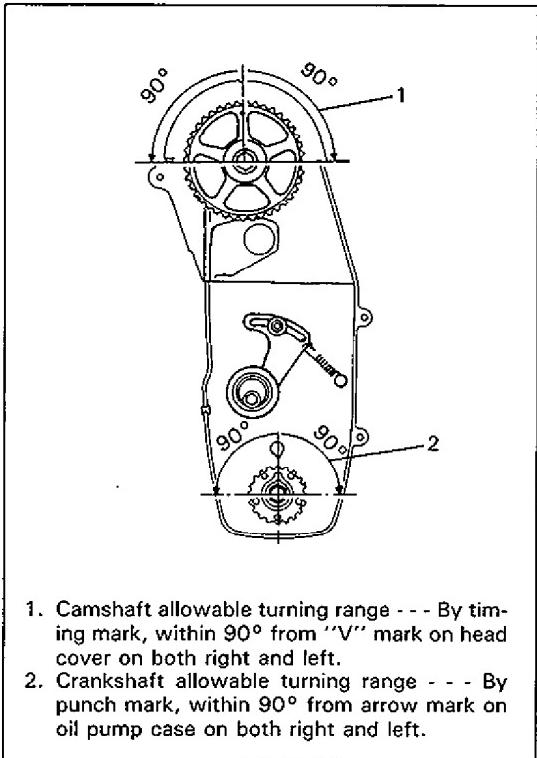
60A50-6A1-23-5S



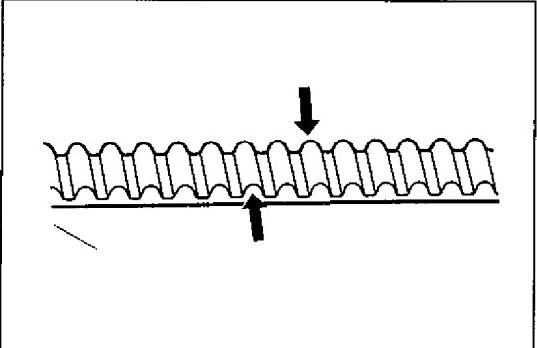
60A50-6A1-24-1S



60A50-6A1-24-2S



60A50-6A1-24-4S



60A50-6A1-24-5S

6. For installation of timing belt, align 4 timing marks as shown in figure by turning crankshaft.

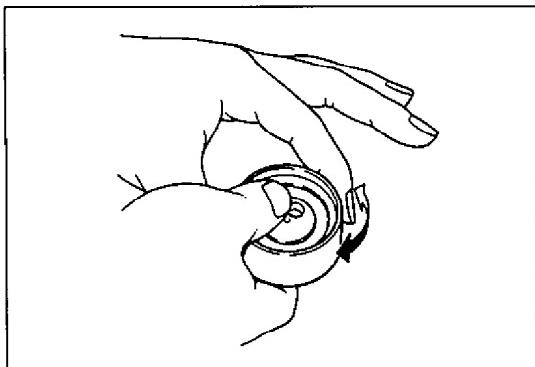
7. Remove timing belt tensioner, tensioner plate, tensioner spring and timing belt.

CAUTION:

- After timing belt is removed, never turn camshaft and crankshaft independently more than such an extent as shown in figure. If turned, interference may occur among piston and valves, and parts related to piston and valves may be damaged.
- Never bend timing belt.

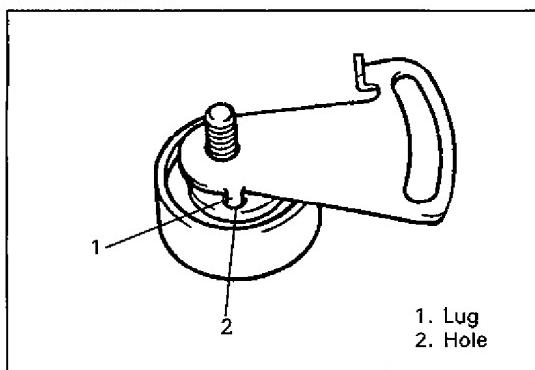
INSPECTION

- Inspect timing belt for wear or crack. Replace it as necessary.



60A50-6A1-25-1S

- Inspect tensioner for smooth rotation.

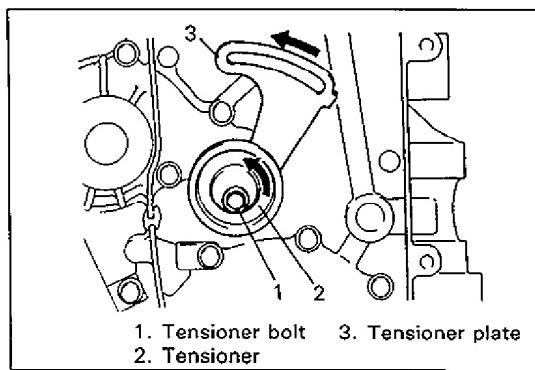


60A50-6A1-25-2S

INSTALLATION

1. Install tensioner plate to tensioner.

Insert lug of tensioner plate into hole in tensioner.

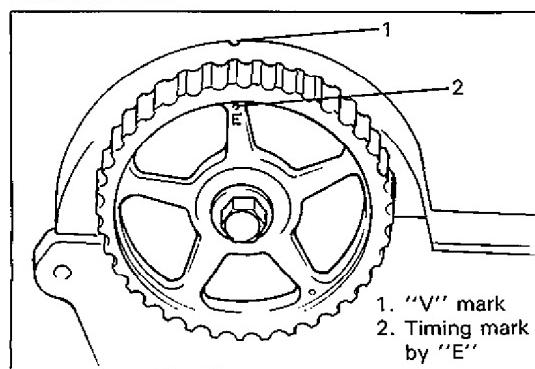


60A50-6A1-25-3S

2. Install tensioner and tensioner plate:

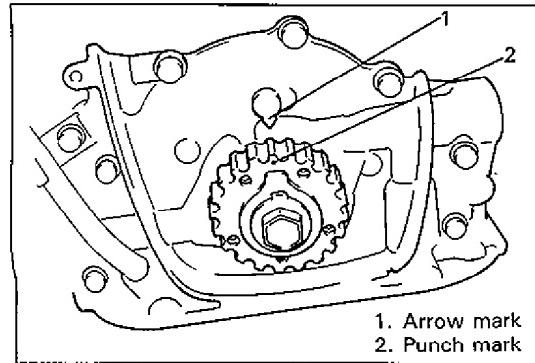
Do not tighten tensioner bolt with wrench yet. Hand tighten only at this time.

Check to ensure that plate movement in arrow direction as shown in figure causes tensioner to move in the same direction. If no associated movement between plate and tensioner occurs, remove tensioner and plate again and reinsert plate lug into tensioner hole.



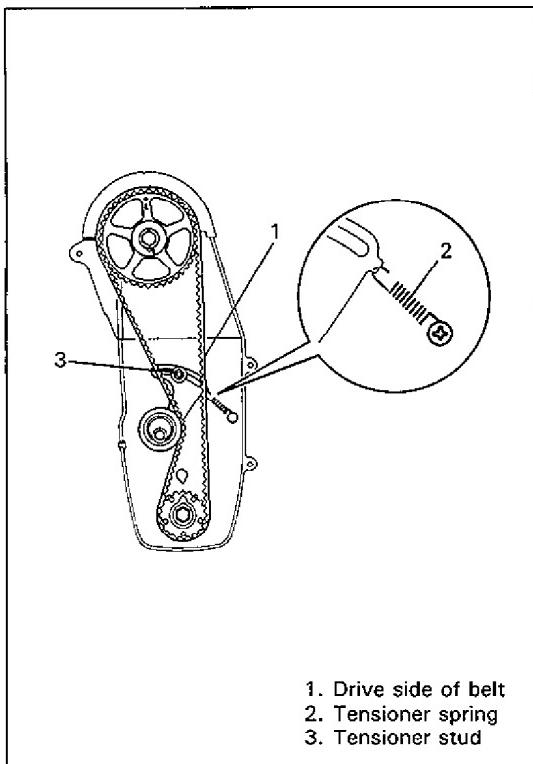
60A50-6A1-25-4S

3. Check that timing mark on camshaft timing belt pulley is aligned with "V" mark on cylinder head cover. If not, align two marks by turning camshaft but be careful not to turn it more than its allowable turning range which is described on page 6A1-24.

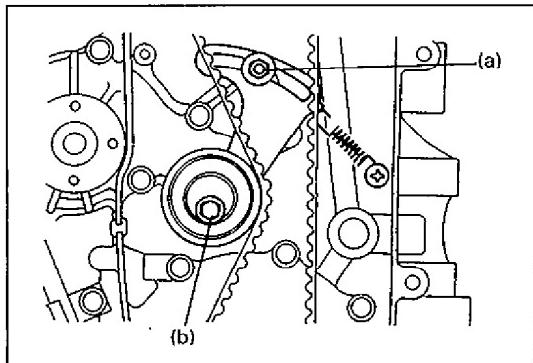


60A50-6A1-25-5S

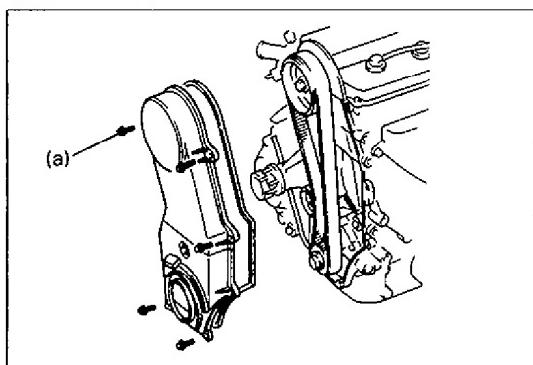
4. Check that punch mark on crankshaft timing belt pulley is aligned with arrow mark on oil pump case. If not, align two marks by turning crankshaft but be careful not to turn it more than its allowable turning range which is described on page 6A1-24.



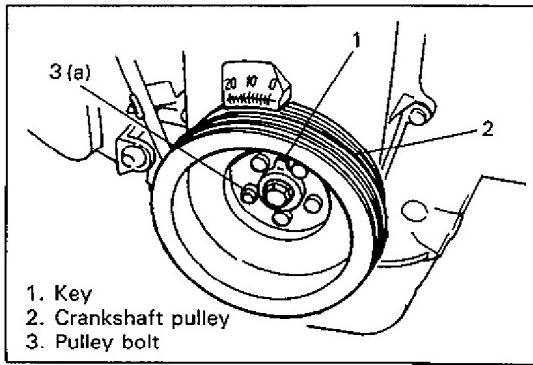
60A50-6A1-26-1S



60A50-6A1-26-3S



60A50-6A1-26-4S



60A50-6A1-26-5S

5. Install timing belt and tensioner spring.

With two sets of marks aligned and tensioner plate pushed up, install timing belt on two pulleys in such a way that drive side of belt is free from any slack.

And then install tensioner spring as shown in figure, and hand-tighten tensioner stud.

NOTE:

- When installing timing belt, match arrow mark (\Rightarrow) on timing belt with rotating direction of crankshaft.
- In this state, No. 4 piston is at top dead center of compression stroke.

6. To take up slack of timing belt, turn crankshaft two rotations clockwise after installing it. After making sure that belt is free from slack, tighten tensioner stud first and then tensioner bolt to each specified torque.

Then confirm again that two sets of marks are aligned respectively.

Tightening Torque

(a): 9–12 N·m (0.9–1.2 kg·m, 7.0–8.5 lb·ft)

(b): 22–28 N·m (2.2–2.8 kg·m, 16.0–20.0 lb·ft)

7. Install timing belt outside cover.

Before installing, make sure that seal is between water pump and oil pump case.

Tightening Torque

(a): 9–12 N·m (0.9–1.2 kg·m, 7.0–8.5 lb·ft)

8. Install crankshaft pulley.

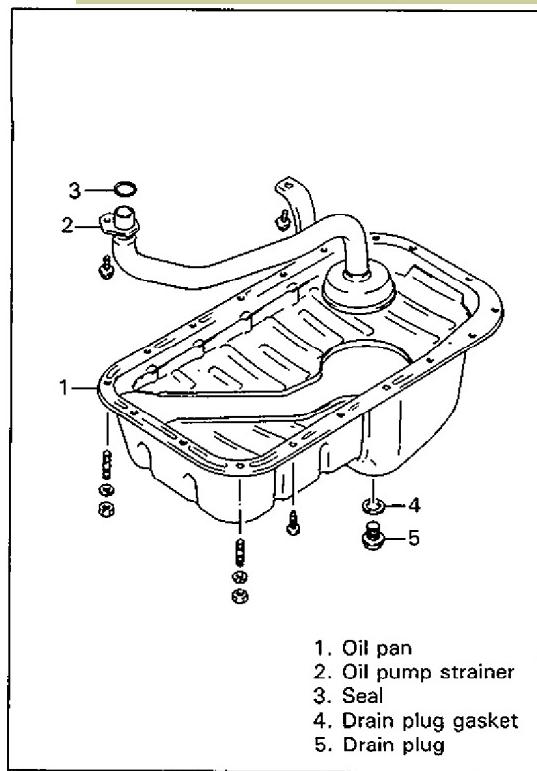
Fit keyway of pulley to key on crank timing belt pulley, and tighten 5 bolts to specified torque.

Tightening Torque

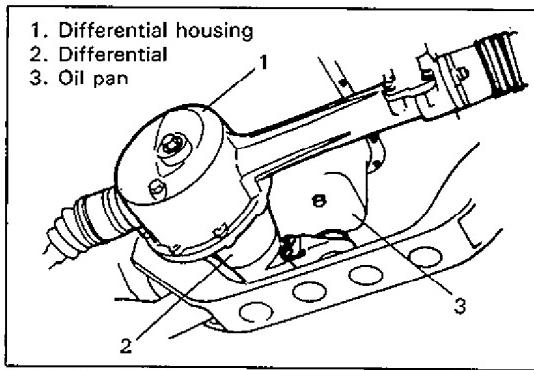
(a): 14–18 N·m (1.4–1.8 kg·m, 10.5–13.0 lb·ft)

9. Install radiator fan shroud, water pump pulley, cooling fan and water pump drive belt.
Adjust water pump drive belt tension, referring to "ENGINE COOLING" section.
10. Install power steering pump belt or A/C compressor belt, if equipped.
Adjust its belt tension, referring to SECTION OB.

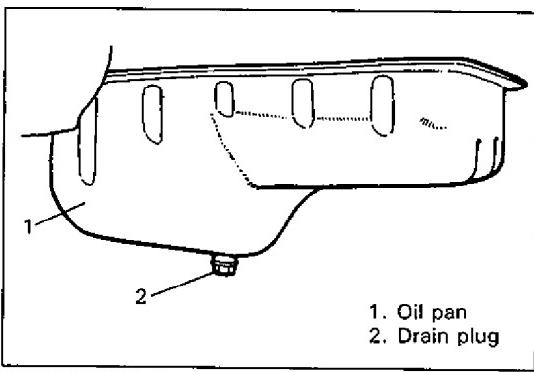
OIL PAN AND OIL PUMP STRAINER



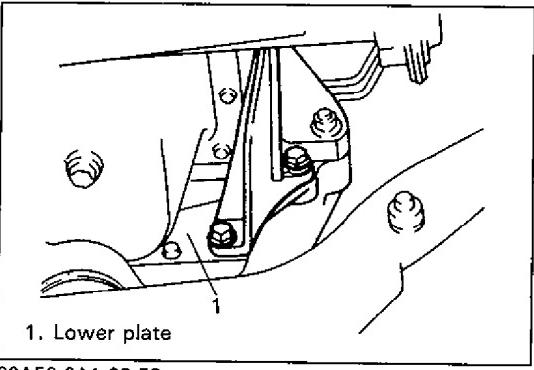
60A50-6A1-28-1S



60A50-6A1-28-3S



60A50-6A1-28-4S

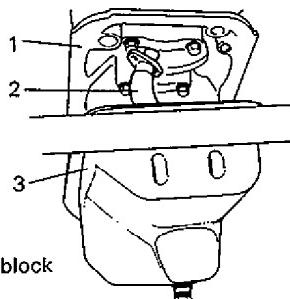


60A50-6A1-28-5S

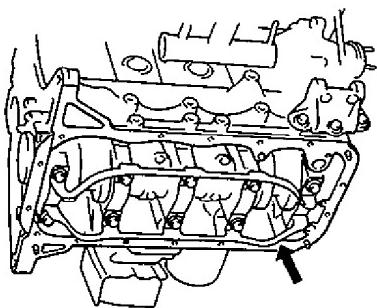
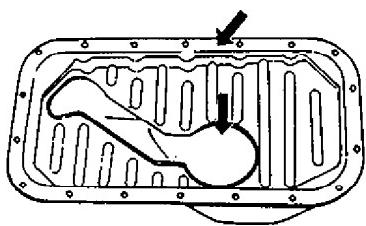
REMOVAL

1. Raise vehicle.
2. Remove front differential housing with differential, referring to "DIFFERENTIAL" section.
3. Drain engine oil by removing drain plug.
4. Remove transmission left side stiffener and then clutch housing (torque converter housing for A/T) lower plate.

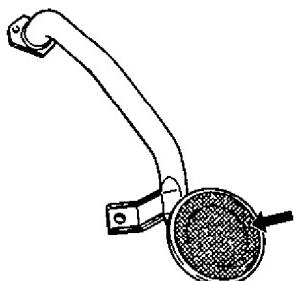
5. Remove oil pan and then oil pump strainer.



60A50-6A1-29-1S



60A50-6A1-29-2S

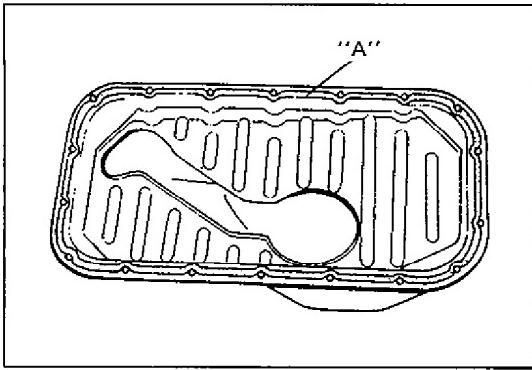


60A50-6A1-29-4S

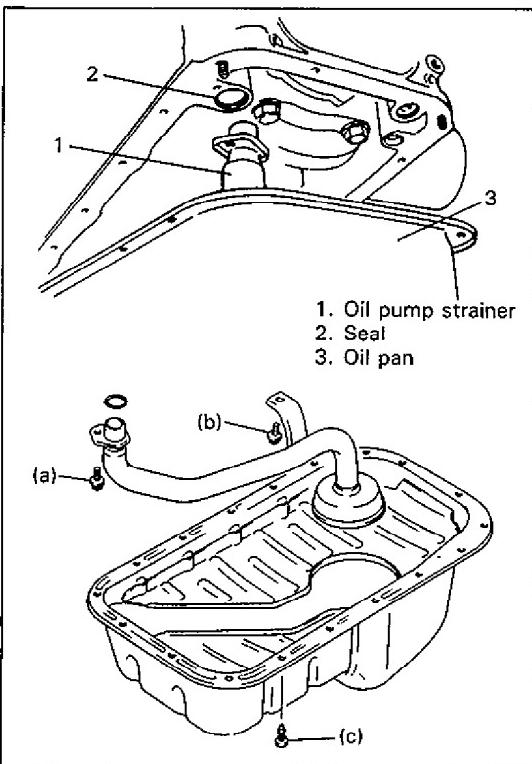
CLEANING

- Clean mating surfaces of oil pan and cylinder block.
Remove oil, old sealant, and dusts from mating surfaces and oil pan inside

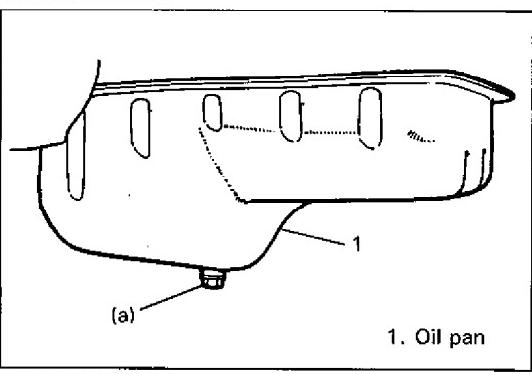
- Clean oil pump strainer screen.



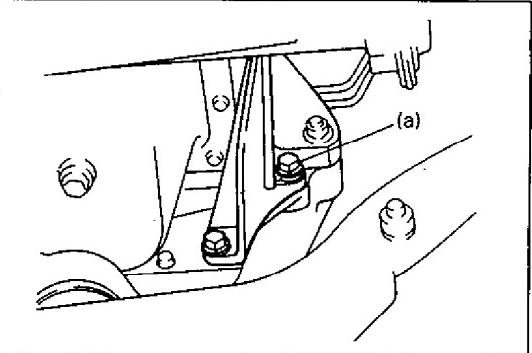
60A50-6A1-30-1S



60A50-6A1-30-2S



60A50-6A1-30-4S



INSTALLATION

1. Apply sealant to oil pan mating surface continuously as shown in figure.

"A" Sealant: 99000-31150

2. Install oil pump strainer and oil pan.

Install seal in the position as shown in figure.

With oil pump strainer inserted into oil pan, install strainer to cylinder block.

Tighten strainer bolt first and then bracket bolt to specified torque.

Tightening Torque

(a): 9–12 N·m (0.9–1.2 kg-m, 7.0–8.5 lb-ft)

(b): 9–12 N·m (0.9–1.2 kg-m, 7.0–8.5 lb-ft)

After fitting oil pan to cylinder block, run in securing bolts and start tightening at the center: move wrench outward, tightening one bolt at a time.

Tighten bolts to specified torque.

Tightening Torque

(c): 9–12 N·m (0.9–1.2 kg-m, 7.0–8.5 lb-ft)

3. Install gasket and drain plug to oil pan.

Tighten drain plug to specified torque.

Tightening Torque

(a): 30–40 N·m (3.0–4.0 kg-m, 22.0–28.5 lb-ft)

4. Install clutch (torque converter) housing lower plate and transmission left side stiffener.

Tightening Torque

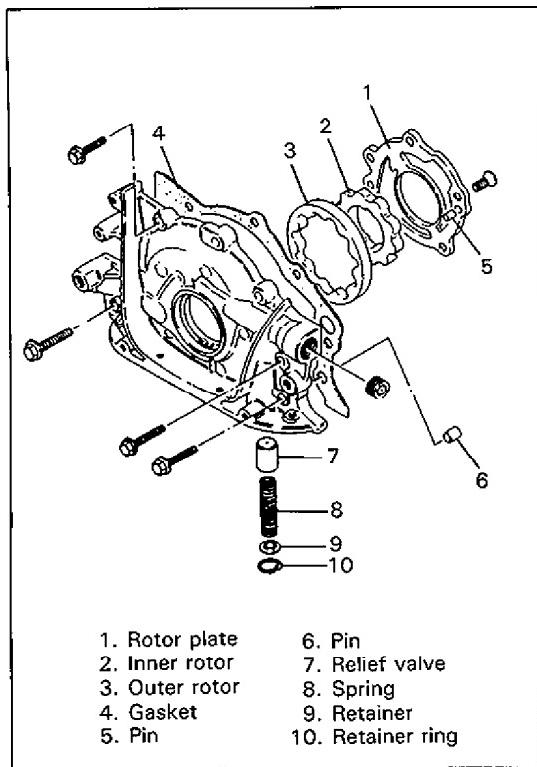
(a): 40–60 N·m (4.0–6.0 kg-m, 29.0–43.0 lb-ft)

60A50-6A1-30-5S

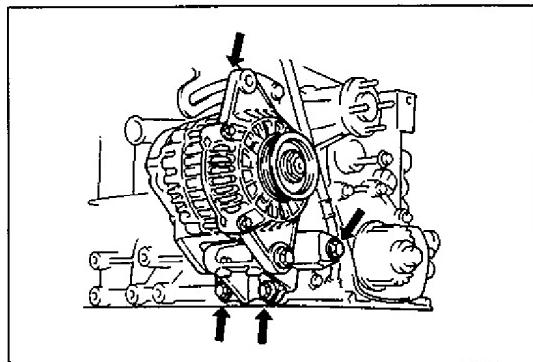
5. Install front differential housing with differential according to installation procedure described in "DIFFERENTIAL" section.
6. Refill front differential housing with gear oil, referring to "DIFFERENTIAL" section.
7. Refill engine with engine oil, referring to item "ENGINE OIL CHANGE" in Section OB.

60A50-6A1-31-1S

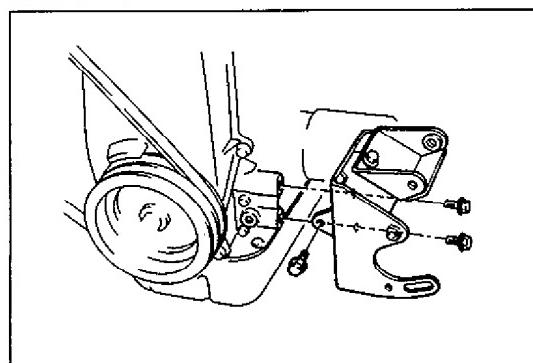
OIL PUMP



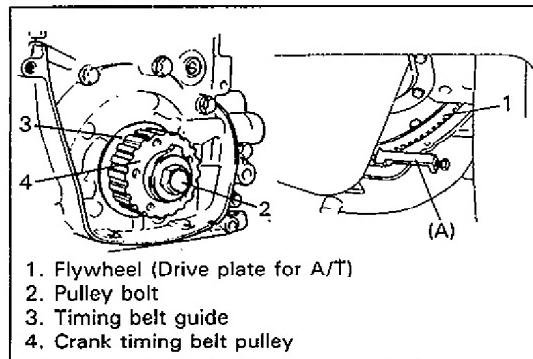
60A50-6A1-32-1S



60A50-6A1-32-3S



60A50-6A1-32-4S



60A50-6A1-32-5S

REMOVAL

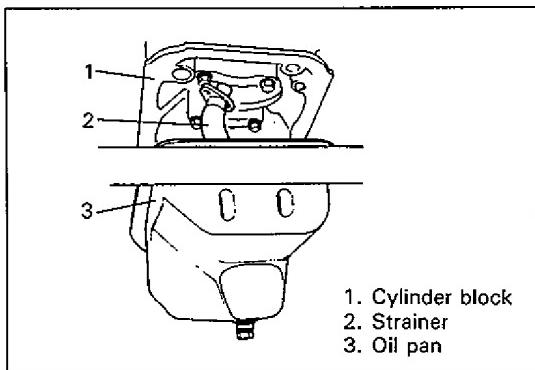
1. Disconnect negative cable at battery.
2. Remove timing belt as previously outlined.
3. Remove generator and its bracket.

4. Remove power steering pump bracket or A/C compressor bracket, if equipped.

5. Remove crankshaft timing belt pulley and timing belt guide. To lock crankshaft, engage special tool (gear stopper) with flywheel ring gear (drive plate ring gear for A/T). With crankshaft locked, remove crankshaft timing belt pulley bolt.

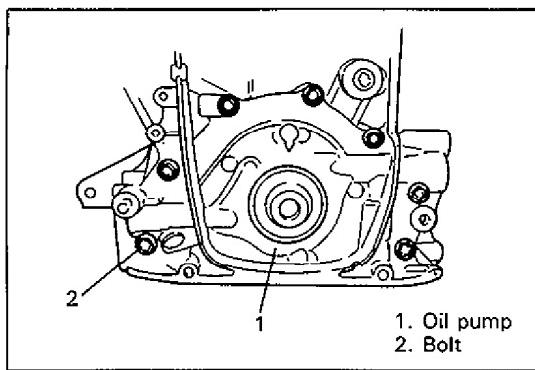
Special Tool

(A): 09927-56010



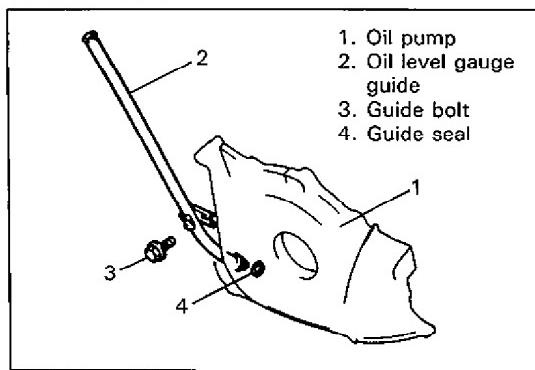
60A50-6A1-33-1S

6. Remove oil pan and oil pump strainer as previously outlined.



60A50-6A1-33-2S

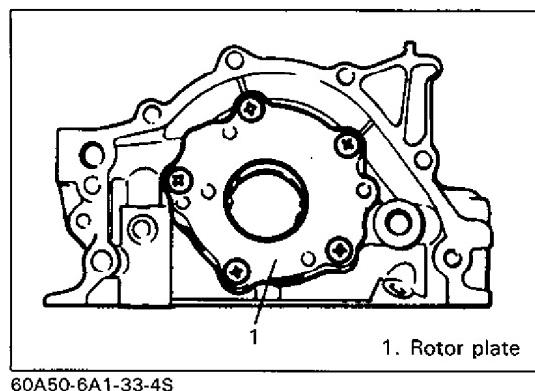
7. Remove oil pump assembly after removing bolts.



60A50-6A1-33-3S

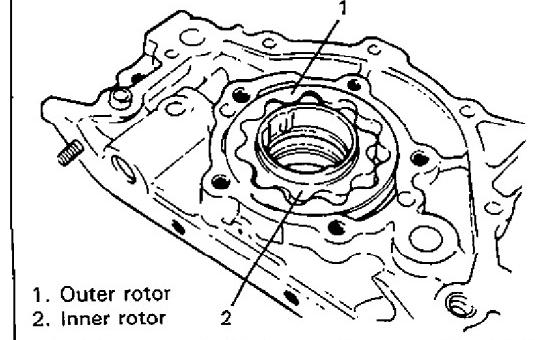
DISASSEMBLY

1. Remove oil level gauge guide bolt and pull out guide from oil pump.



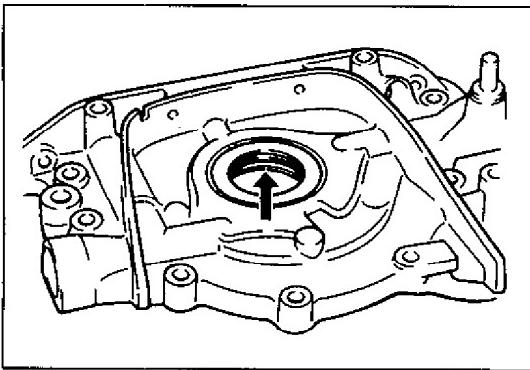
60A50-6A1-33-4S

2. Remove rotor plate.



60A50-6A1-33-5S

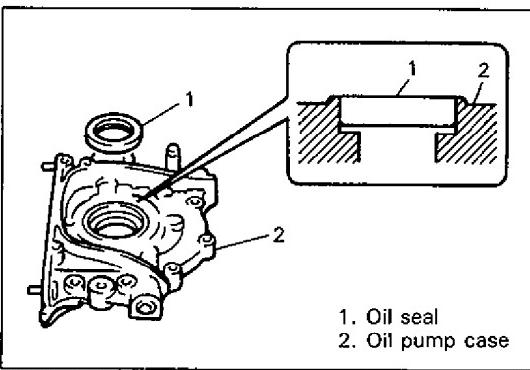
3. Remove outer rotor and inner rotor.



60A50-6A1-34-1S

INSPECTION

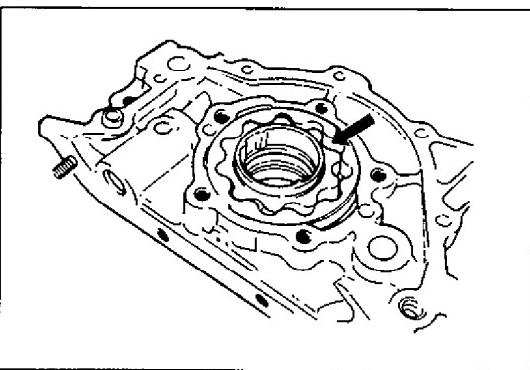
- Check oil seal lip for fault or other damage. Replace as necessary.



60A50-6A1-34-2S

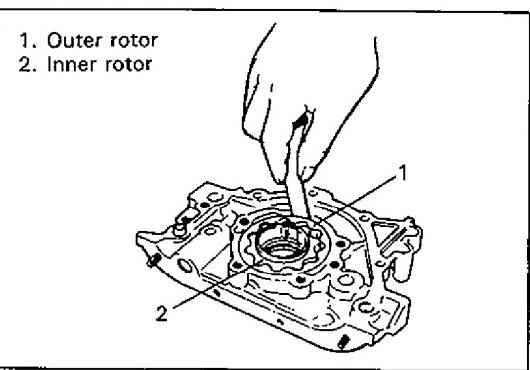
NOTE:

When installing oil seal, press-fit it till its end face is flush with oil pump case end face.



60A50-6A1-34-3S

- Check outer and inner rotors, rotor plate, and oil pump case for excessive wear or damage.



60A50-6A1-34-4S

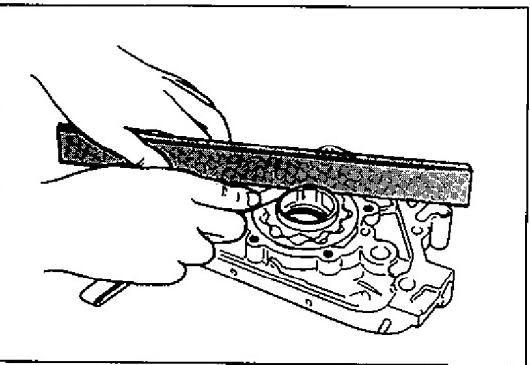
MEASUREMENT

• Radial clearance

Check radial clearance between outer rotor and case, using thickness gauge.

If clearance exceeds its limit, replace outer rotor or case.

Limit on radial clearance between outer rotor and case:
0.310 mm (0.0122 in.)

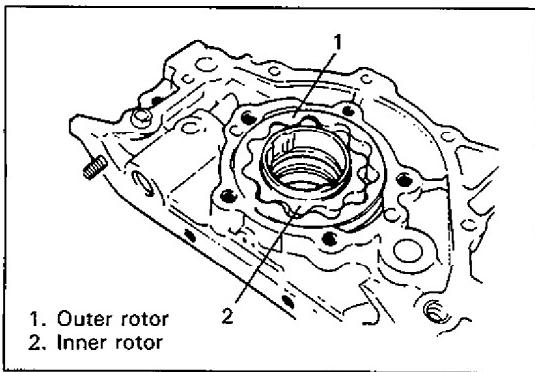


60A50-6A1-34-5S

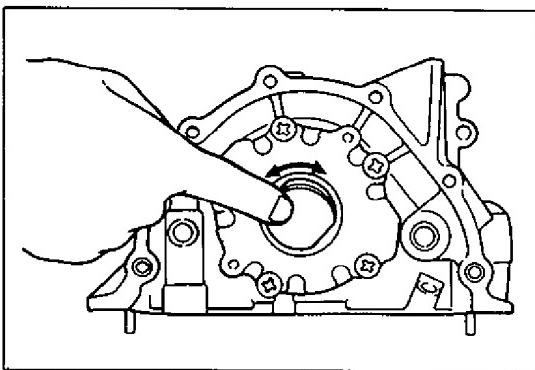
• Side clearance

Using straight edge and thickness gauge, measure side clearance.

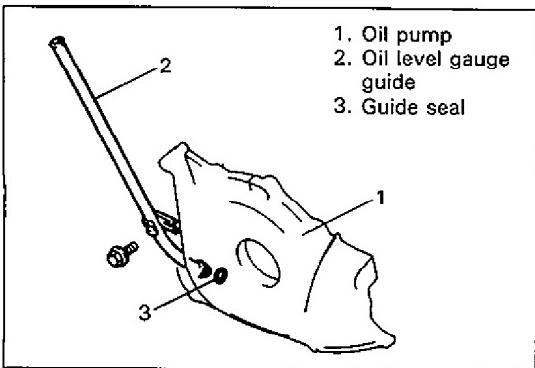
Limit on side clearance: 0.15 mm (0.0059 in.)



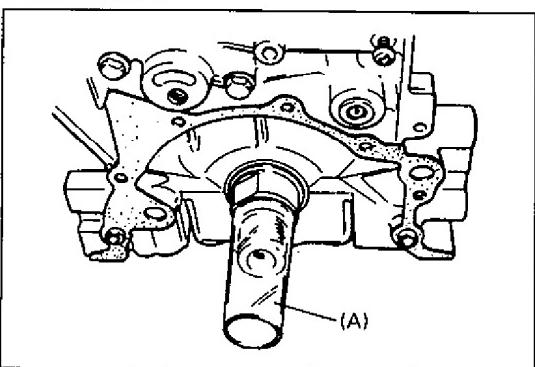
60A50-6A1-35-1S



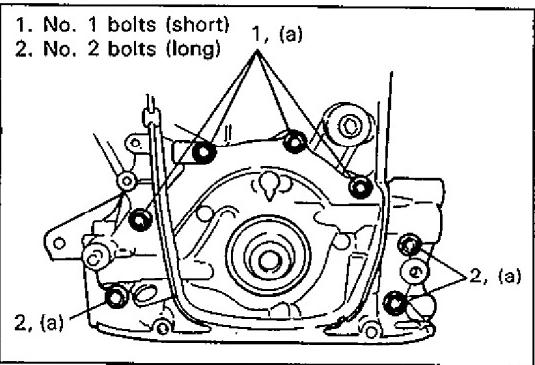
60A50-6A1-35-2S



60A50-6A1-35-3S



60A50-6A1-35-4S



ASSEMBLY

1. Wash, clean and then dry all disassembled parts.
2. Apply thin coat of engine oil to inner and outer rotors, oil seal lip portion, and inside surfaces of oil pump case and plate.
3. Install outer and inner rotors to pump case.

4. Install rotor plate. Tighten 5 screw securely.

After installing plate, check to be sure that gears turn smoothly by hand.

5. Apply engine oil to guide seal and install guide seal and guide.

INSTALLATION

1. Install two oil pump pins and oil pump gasket to cylinder block. Use a new gasket.
2. To prevent oil seal lip from being damaged or upturned when installing oil pump to crankshaft, fit special tool (Oil seal guide) to crankshaft, and apply engine oil to special tool.

Special Tool

(A): 09926-18210

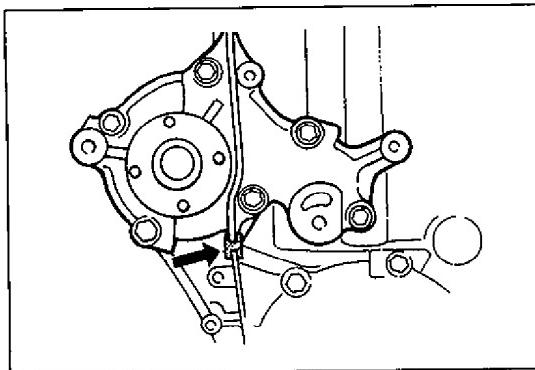
3. Install oil pump to cylinder block.

As there are 2 types of oil pump bolts, refer to figure for their correct use and tighten them to specified torque.

Tightening Torque

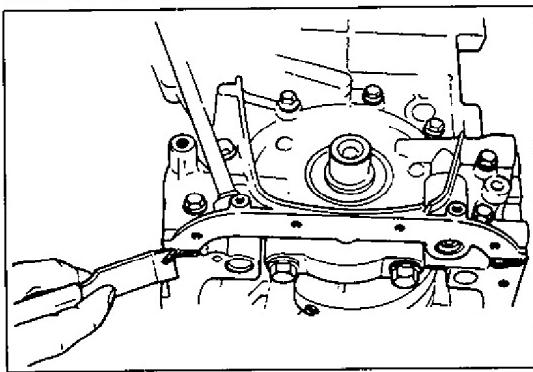
(a): 9–12 N·m (0.9–1.2 kg·m, 7.0–8.5 lb·ft)

60A50-6A1-35-5S



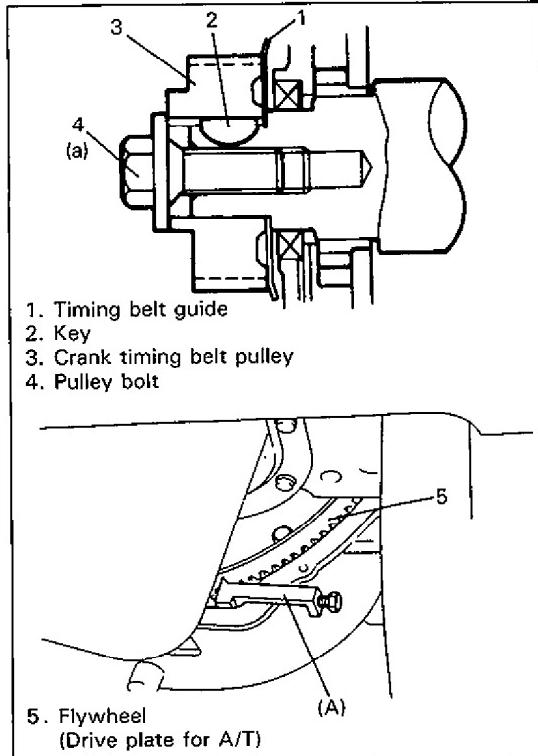
60A50-6A1-36-1S

4. Install rubber seal between oil pump and water pump.



60A50-6A1-36-2S

5. Edge of oil pump gasket might bulge out: if it does, cut it off with a sharp knife, making edge smooth and flush with end faces of pump case and cylinder block.



60A50-6A1-36-3S

6. Install timing belt guide, key, and crank timing belt pulley. Refer to figure for proper installation of these parts. Install timing belt guide in such a way that its concave side faces oil pump.
With crankshaft locked, tighten crank timing belt pulley bolt to specified torque.

Tightening Torque

(a): 125–135 N·m (12.5–13.5 kg-m, 90.5–97.5 lb-ft)

Special Tool

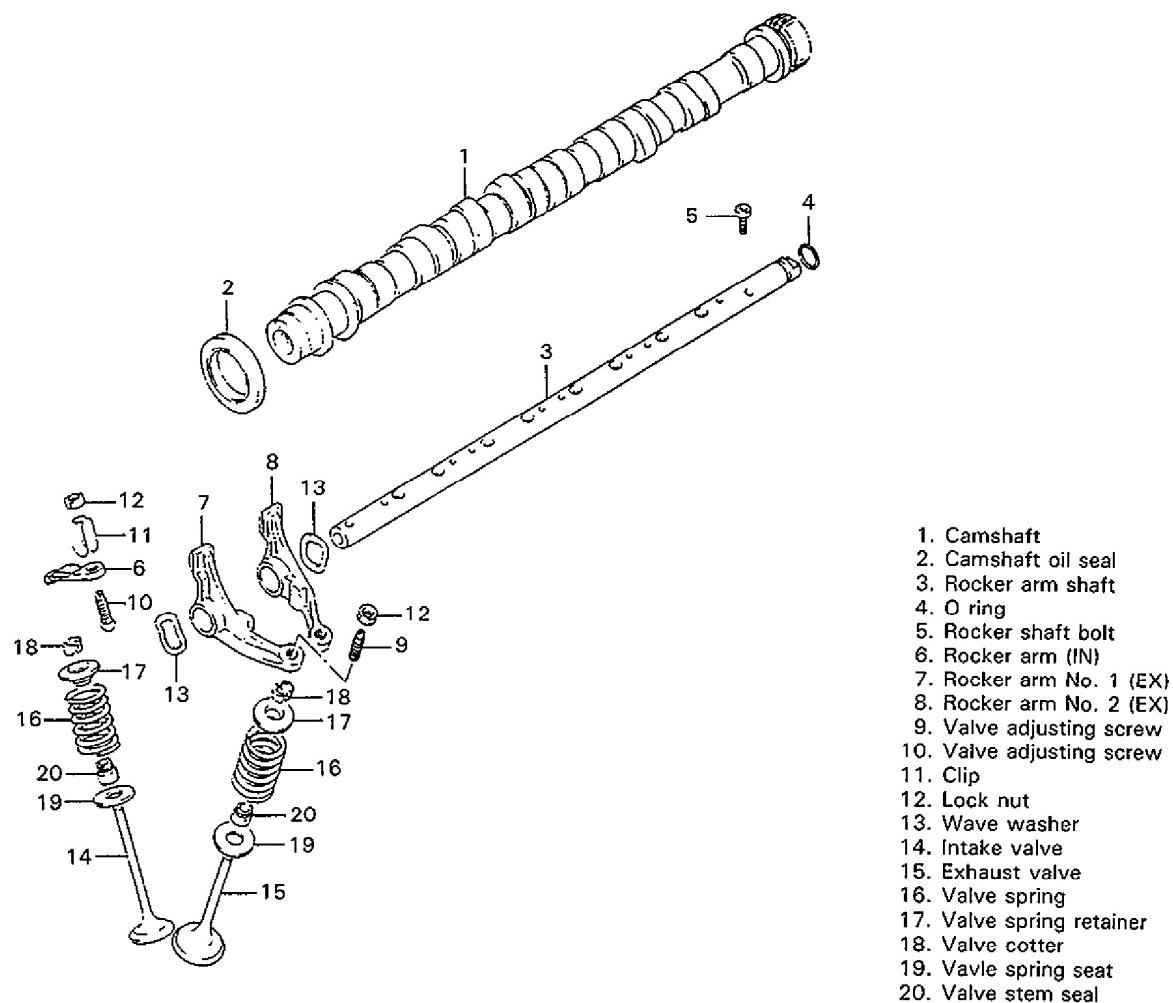
(A): 09927-56010

7. Install timing belt, tensioner, oil pump strainer, oil pan and other parts as previously outlined.
8. Check to ensure that all removed parts are back in place. Reinstall any necessary parts which have not been reinstalled.
9. Adjust water pump drive belt tension, referring to "ENGINE COOLING" section.

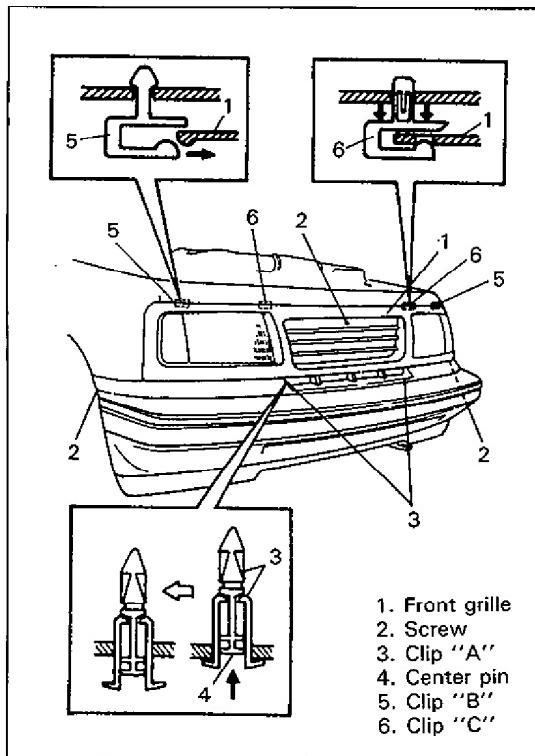
10. Adjust power steering pump belt tension or A/C compressor belt tension, if equipped.
Refer to SECTION 0B.
11. Refill engine with engine oil, referring to item "ENGINE OIL CHANGE" in SECTION 0B.
12. Refill front differential housing with gear oil, referring to "DIFFERENTIAL" section.
13. Connect negative cable at battery.
14. After completing installation, check oil pressure by running engine.

60A50-6A1-37-1S

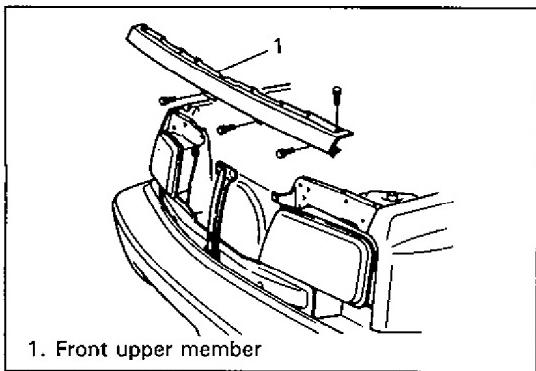
ROCKER ARMS, ROCKER ARM SHAFT AND CAMSHAFT



60A50-6A1-38-1S

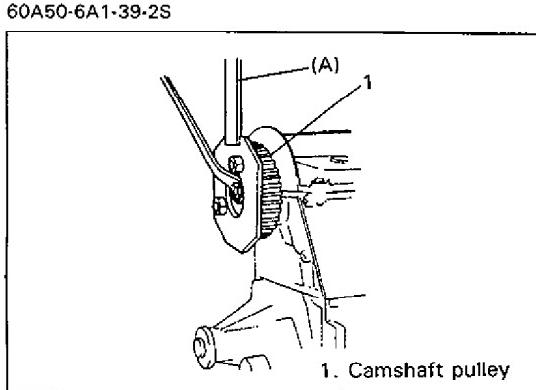


60A50-6A1-38-4S



60A50-6A1-39-1S

3. Removal engine hood lock from front upper member and disconnect lead wire from horn.
4. Remove front upper member from body.



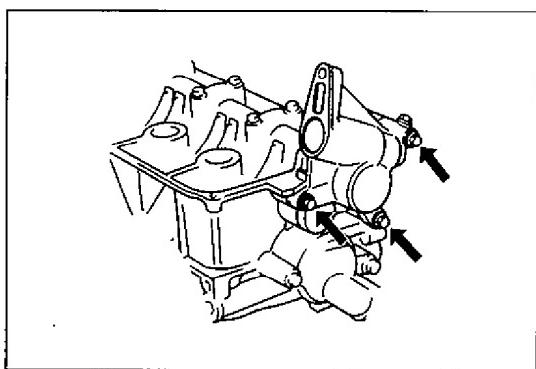
60A50-6A1-39-2S

5. Remove radiator referring to "ENGINE COOLING" section.
6. Remove timing belt as previously outlined.

Special Tool

(A): 09917-68220

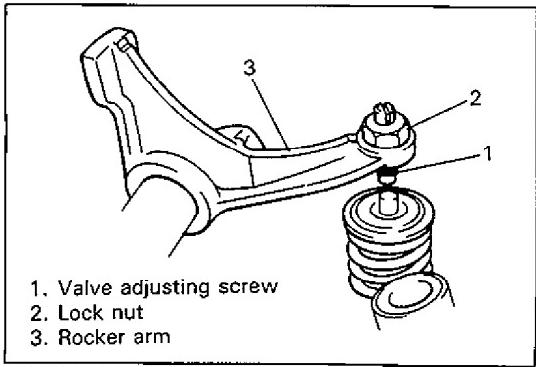
7. Remove camshaft timing belt pulley by using special tool.
8. Remove cylinder head cover as previously outlined.



60A50-6A1-39-3S

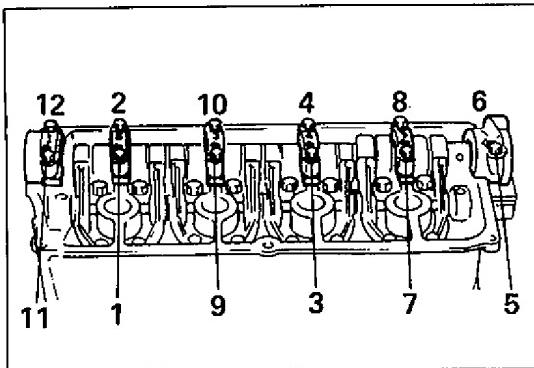
9. Remove distributor and then distributor case from cylinder head.

Place a container or rag under distributor case, for a small amount of oil flows out during removal of case.

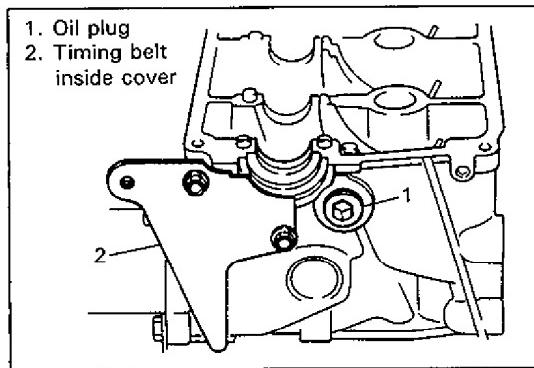


60A50-6A1-39-4S

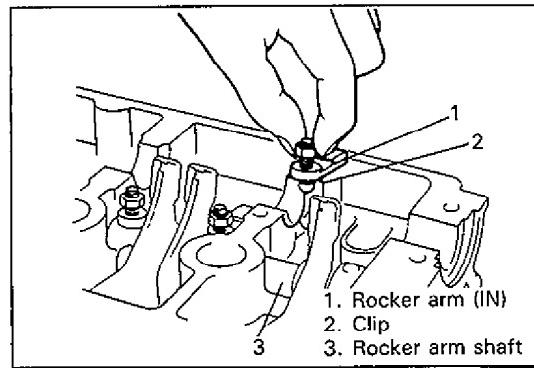
10. After loosening all valve adjusting screw lock nuts, turn adjusting screws back all the way to allow all rocker arms to move freely.



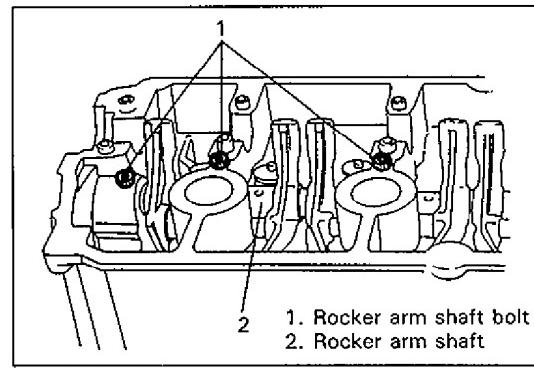
60A50-6A1-40-1S



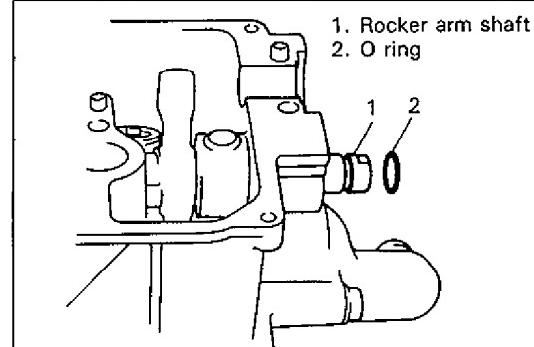
60A50-6A1-40-2S



60A50-6A1-40-3S



60A50-6A1-40-4S



11. Remove camshaft housing and camshaft.

NOTE:

To remove camshaft housing bolts, loosen them in such order as indicated in figure, a little at a time.

12. Remove rocker arm shaft plug and timing belt inside cover.

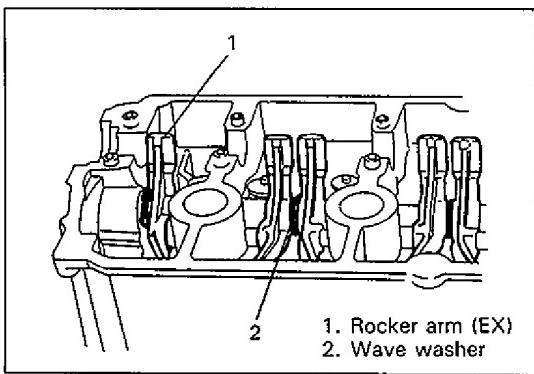
13. Remove intake rocker arm with clip from rocker arm shaft.

NOTE:

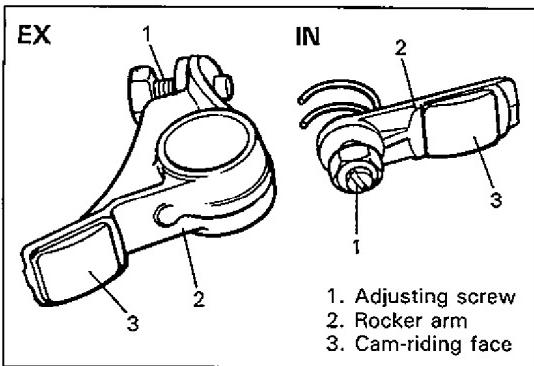
Do not bend clip when removing intake rocker arm.

14. Remove rocker arm shaft bolts.

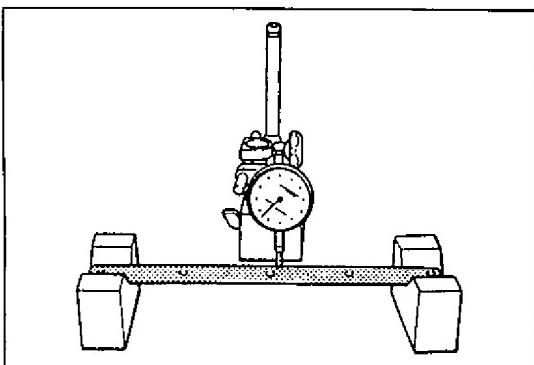
15. Push off rocker arm shaft end to distributor side and remove O-ring from shaft.



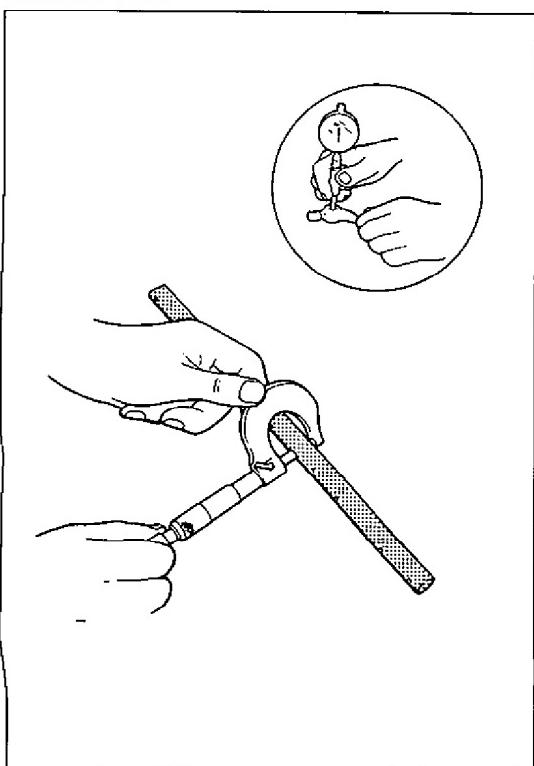
60A50-6A1-41-1S



60A50-6A1-41-2S



60A50-6A1-41-3S



60A50-6A1-41-4S

16. Remove exhaust rocker arms and wave washer by pulling rocker arm shaft to front side.

INSPECTION

Adjusting Screw and Rocker Arm

If tip of adjusting screw is badly worn, replace it. Rocker arm must be replaced if its cam-riding face is badly worn.

Rocker Arm Shaft Runout

Using "V" blocks and dial gauge, check runout. If runout exceeds its limit, replace rocker arm shaft.

Runout limit: 0.20 mm (0.008 in.)

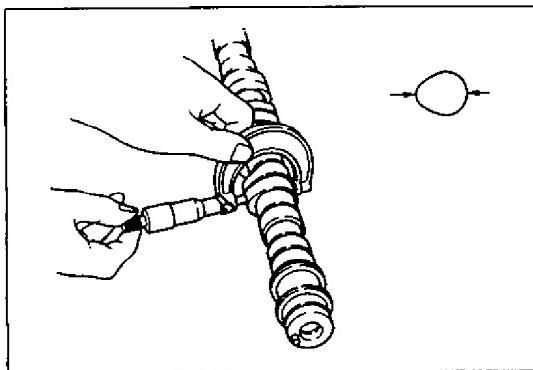
Rocker Arm-to-Rocker Arm Shaft Clearance

Using a micrometer and a bore gauge, measure rocker shaft dia. and rocker arm I.D.

Difference between two readings is arm-to-shaft clearance on which a limit is specified.

If limit is exceeded, replace shaft or arm, or both.

Item	Standard	Limit
Rocker arm I.D.	15.985–16.005 mm (0.629–0.630 in.)	—
Rocker arm shaft dia.	15.969–15.984 mm (0.6287–0.6293 in.)	—
Arm-to-shaft clearance	0.001–0.036 mm (0.0001–0.0014 in.)	0.09 mm (0.0035 in.)

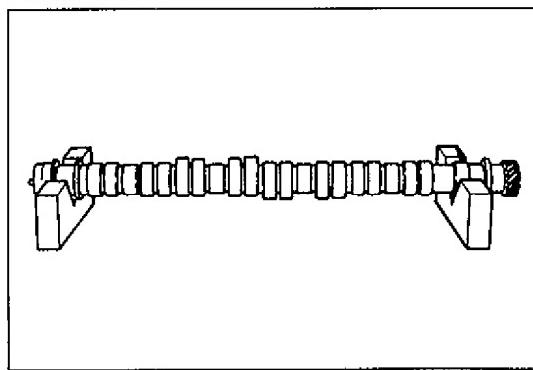


60A50-6A1-42-1S

Cam Wear

Using a micrometer, measured height of cam. If measured height is below limit, replace camshaft.

Cam height	Standard	Limit
Intake cam	35.888–36.048 mm (1.4130–1.4192 in.)	35.788 mm (1.4090 in.)
Exhaust cam	36.322–36.482 mm (1.4300–1.4362 in.)	36.222 mm (1.4261 in.)



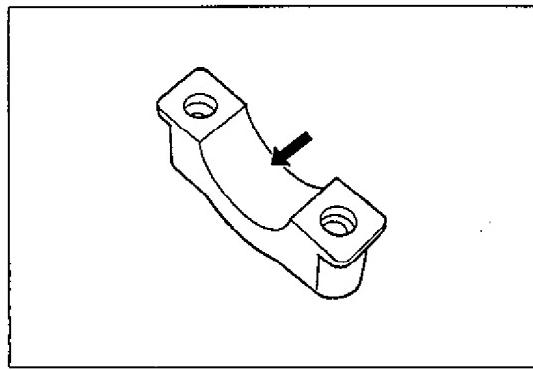
60A50-6A1-42-2S

Camshaft Runout

Hold camshaft between two "V" blocks, and measure runout by using a dial gauge.

If runout exceeds the limit, replace camshaft.

Runout limit: 0.10 mm (0.0039 in.)

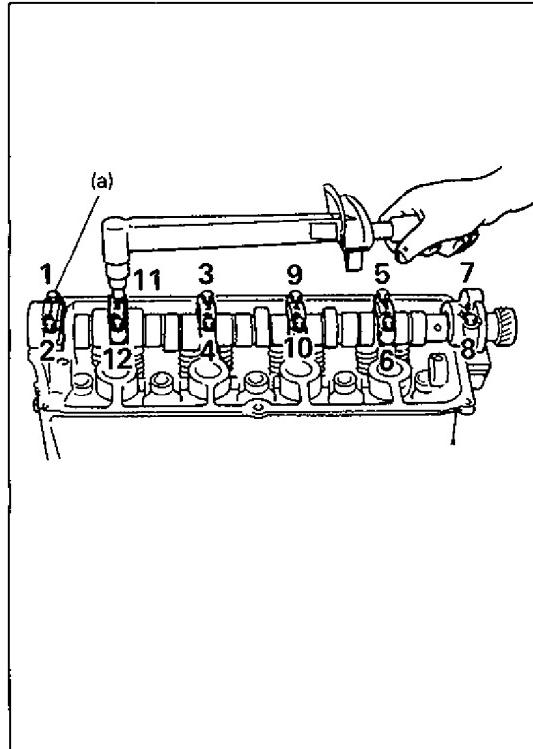


60A50-6A1-42-3S

Chamshaft Journal Wear

Check camshaft journals and camshaft housings for pitting, scratches, wear or damage.

If any malcondition is found, replace camshaft or cylinder head with housing. Never replace cylinder head without replacing housing.



60A50-6A1-42-4S

Check clearance by using gaging plastic.

The procedure is as follows.

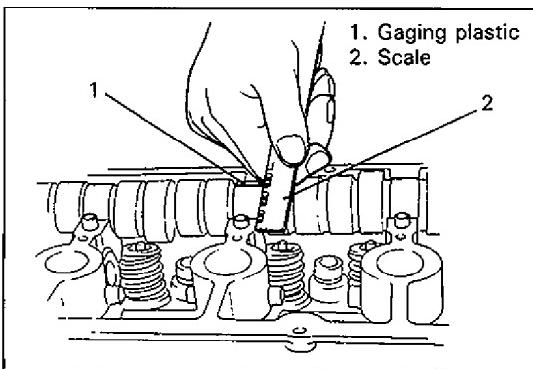
1. Clean housings and camshaft journals.
2. Install camshaft to cylinder head.
3. Place a piece of gaging plastic the full width of journal of camshaft (parallel to camshaft).
4. Install camshaft housing, referring to page 6A1-44.
5. Tighten camshaft housing bolts in such order as indicated in figure a little at a time till they are tightened to specified torque.

Tightening Torque

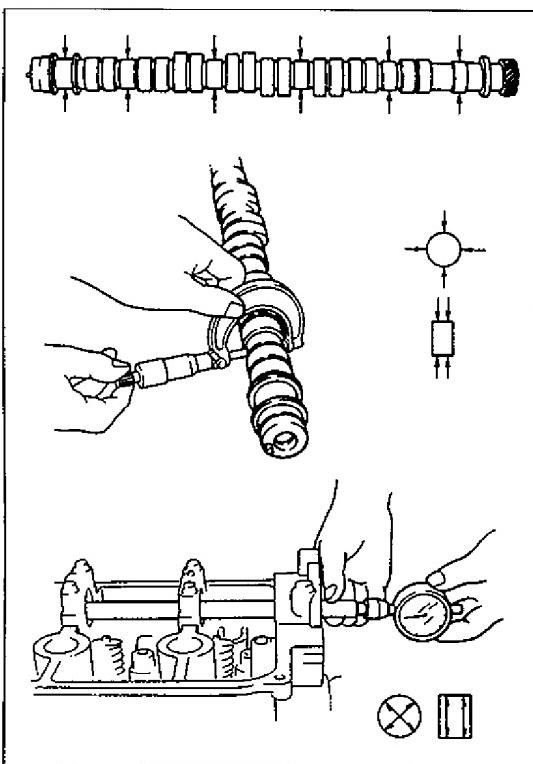
(a): 9–12 N·m (0.9–1.2 kg·m, 7.0–8.5 lb·ft)

NOTE:

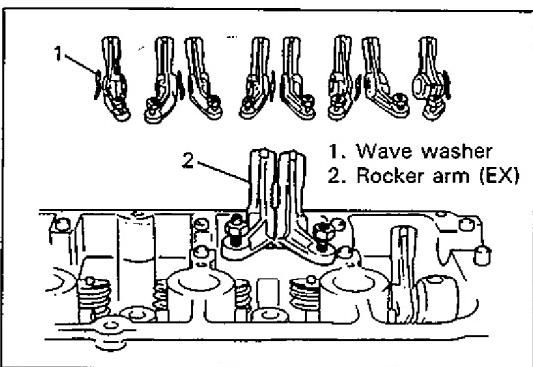
Do not rotate camshaft while gaging plastic is installed.



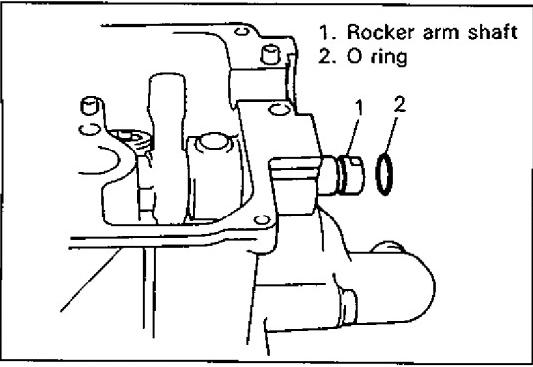
60A50-6A1-43-1S



60A50-6A1-43-2S



60A50-6A1-43-4S



60A50-6A1-43-5S

6. Remove housing and using scale on gagine plastic envelope, measure gaging plastic width at its widest point.

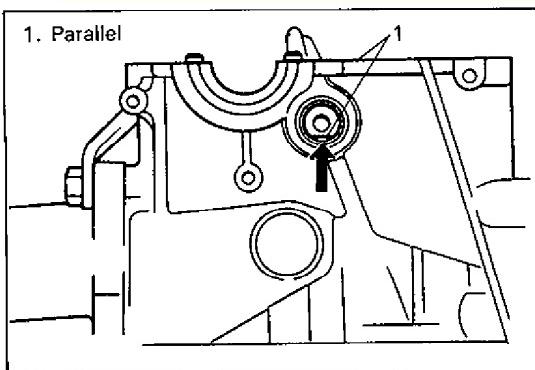
	Standard	Limit
Journal clearance	0.040–0.082 mm (0.0016–0.0032 in.)	0.12 mm (0.0047 in.)

If measured camshaft journal clearance exceeds limit, measure journal (housing) bore and outside diameter of camshaft journal. Replace camshaft or cylinder head assembly whichever the difference from specification is greater.

Item	Standard
Camshaft journal bore dia.	28.000–28.021 mm (1.1024–1.1031 in.)
Camshaft journal O.D.	27.939–27.960 mm (1.1000–1.1008 in.)

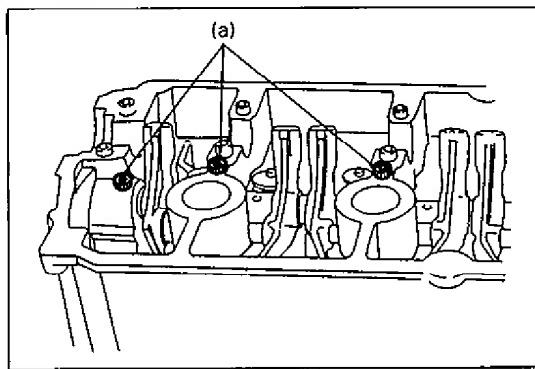
INSTALLATION

1. Apply engine oil to rocker arm shaft and rocker arms.
2. Install rocker arm shaft, rocker arm (exhaust side) and wave washer.
3. Check O-ring for damage or deterioration. With O-ring groove in rocker arm shaft exposed to transmission side once, install O-ring to rocker arm shaft.



60A50-6A1-44-1S

- Set rocker arm shaft so that its cut part faces down and becomes in parallel with head cover mating surface.

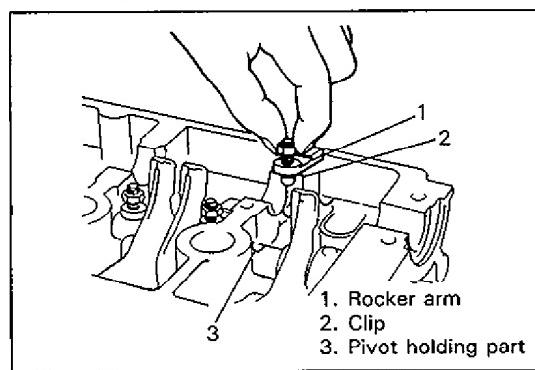


60A50-6A1-44-2S

- Install rocker arm shaft bolts and tighten them to specified torque.

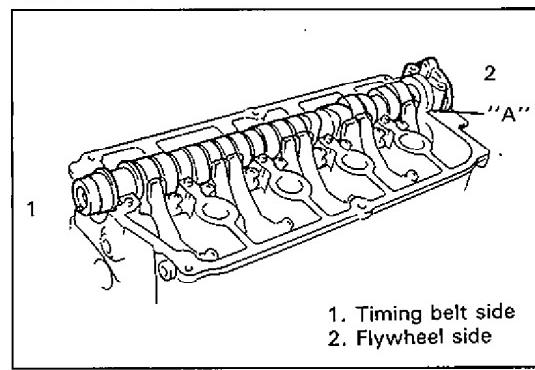
Tightening Torque

(a): 9–12 N·m (0.9–1.2 kg·m, 7.0–8.5 lb·ft)



60A50-6A1-44-3S

- Fill small amount of engine oil into arm pivot holding part of rocker arm shaft. Install rocker arm (intake side) with clips to rocker arm shaft.

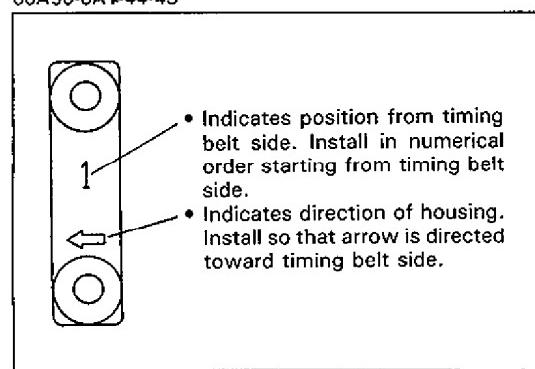


60A50-6A1-44-4S

- Apply engine oil to cams and journals on camshaft and put camshaft on cylinder head. Install camshaft housing to camshaft and cylinder head.

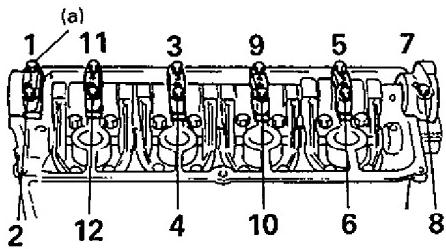
- Apply engine oil to sliding surface of each housing against camshaft journal.
- Apply sealant to mating surface of No.6 housing which will mate with cylinder head.

"A" Sealant: 99000-31110



60A50-6A1-44-5S

- Embossed marks are provided on each camshaft housing, indicating position and direction for installation. Install housings as indicated by these marks.
- As camshaft housing No.1 retains camshaft in proper position as to thrust direction, make sure to first fit No.1 housing to No.1 journal of camshaft securely.



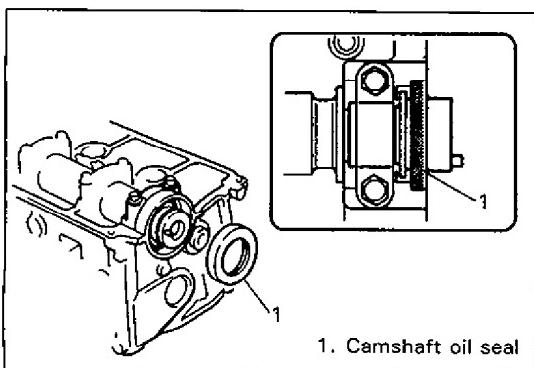
60A50-6A1-45-1S

- After applying engine oil to housing bolts, tighten them temporarily first. Then tighten them by following sequence as indicated in figure.

Tighten a little at a time and evenly among bolts and repeat tightening sequence three to four times before they are tightened to specified torque.

Tightening Torque

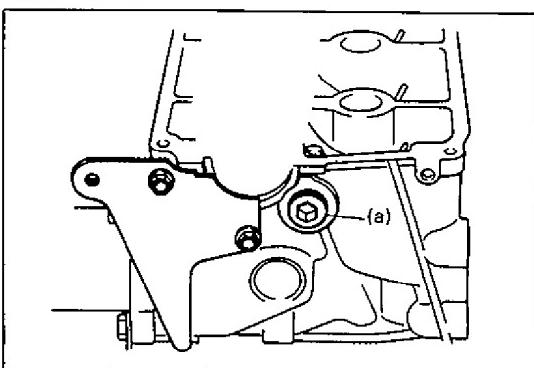
(a): 9–12 N·m (0.9–1.2 kg·m, 7.0–8.5 lb·ft)



60A50-6A1-45-2S

8. Install camshaft oil seal.

After applying engine oil to oil seal lip, press-fit camshaft oil seal till oil seal surface becomes flush with housing surface.

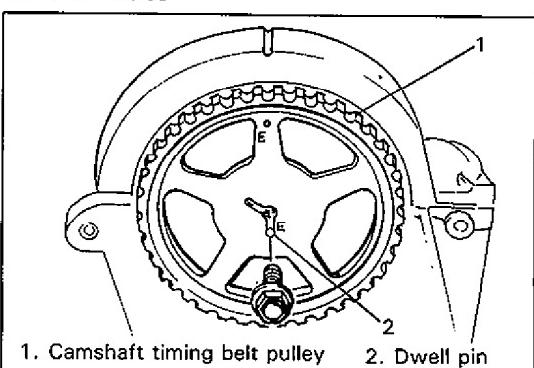


60A50-6A1-45-3S

9. Install rocker arm shaft plug and timing belt inside cover. Then tighten rocker arm shaft plug to specified torque.

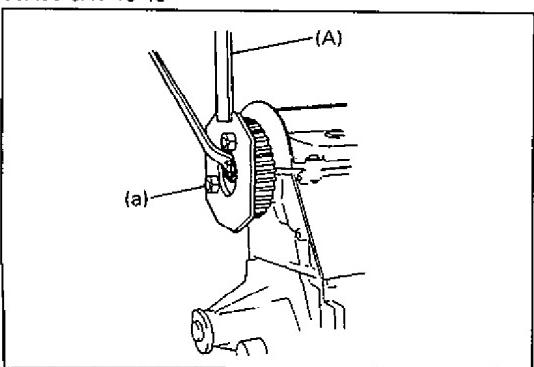
Tightening Torque

(a): 30–35 N·m (3.0–3.5 kg·m, 22.0–25.0 lb·ft)



60A50-6A1-45-4S

10. Install camshaft timing belt pulley to camshaft while fitting pin on camshaft into slot at "E" mark.



60A50-6A1-45-5S

11. Using special tool, tighten pulley bolt to specified torque.

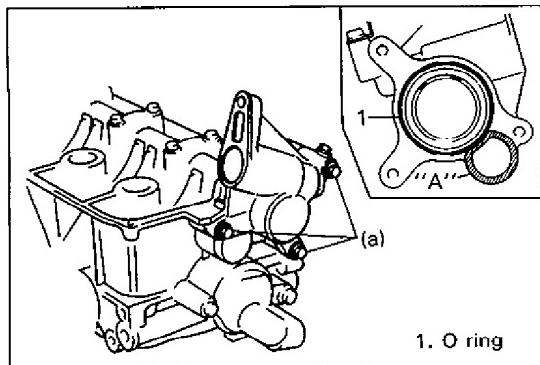
Tightening Torque

(a): 56–64 N·m (5.6–6.4 kg·m, 41.0–46.0 lb·ft)

Special Tool

(A): 09917-68220

12. Install belt tensioner, timing belt, outside cover, crankshaft pulley and water pump belt as previously outlined.



60A50-6A1-46-1S

13. After applying sealant to part "A" as shown in figure at the left, install distributor case to cylinder head and tighten its fixing bolts to specified torque.

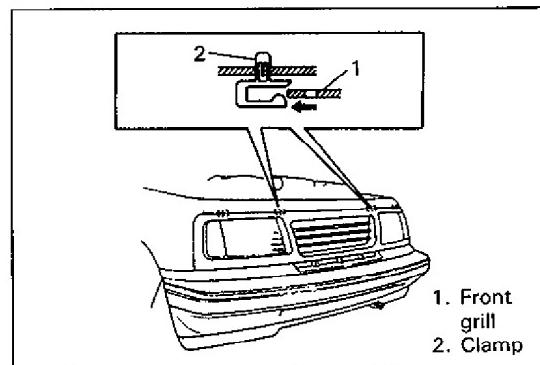
"A" Sealant: 99000-31110

Tightening Torque

(a): 9–12 N·m (0.9–1.2 kg·m, 7.0–8.5 lb·ft)

Install distributor assembly. (Refer to Section 6F1.)

60A50-6A1-46-2S



60A50-6A1-46-3S

17. Install hood lock to front upper member, connect lead wire to horn and then install front upper member to body.

18. Install front grill.

Clamp as shown in figure should be removed from front grill and installed to body first. Then install front grill to clamp.

60A50-6A1-46-4S

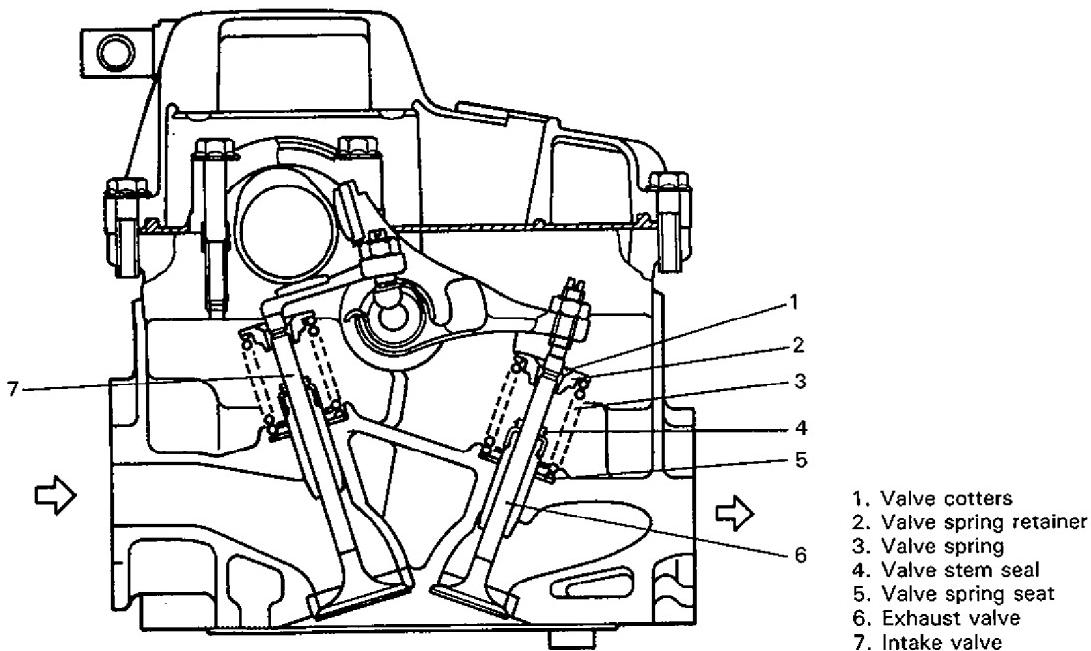
19. Refill A/T fluid referring to Section 7B for A/T.

20. Connect negative cable at battery.

21. Upon completion of installation, verify that there is no water leakage or A/T fluid leakage (for A/T vehicle) at each connection.

22. Adjust ignition timing. Refer to Section 6F1 for adjustment.

VALVES AND CYLINDER HEAD



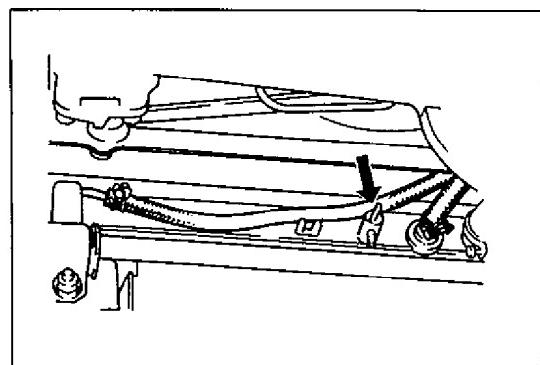
60A50-6A1-47-1S

REMOVAL

1. Relieve fuel pressure according to procedure described in p. 6-4.
2. Disconnect negative cable at battery.

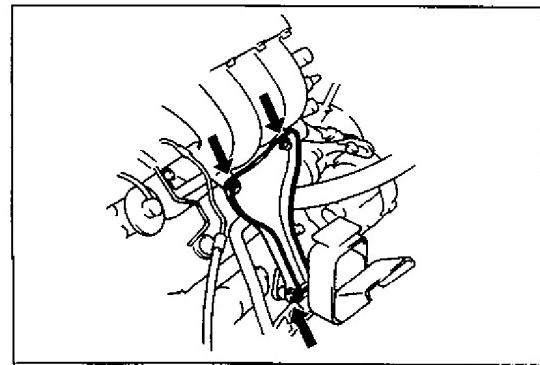
60A50-6A1-47-3S

3. Drain cooling system.



60A50-6A1-47-4S

4. Remove intake manifold stiffener.

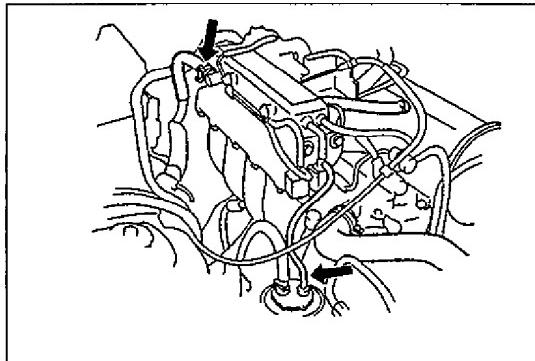


60A50-6A1-47-5S

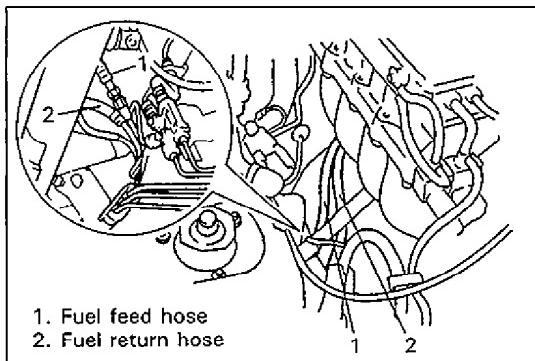
5. Disconnect following electric wires:

- Distributor
 - Ground wires from surge tank
 - EGR VSV (if equipped)
 - Canister purge VSV
 - Water temp. gauge
 - WTS
 - Injectors, TPS and ISC valve wires at the coupler
 - Oxygen sensor (if equipped)
- and then release above wire harnesses from clamps.

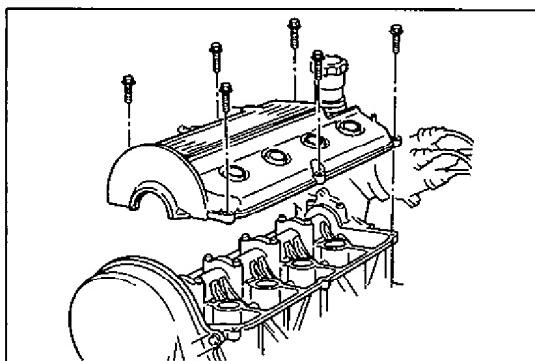
60A50-6A1-48-1S



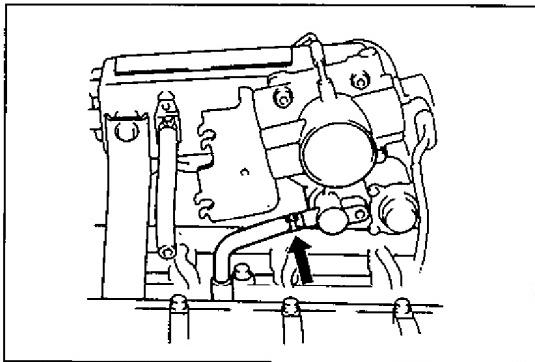
60A50-6A1-48-2S



60A50-6A1-48-3S



60A50-6A1-48-4S



6. Disconnect vacuum hoses:

- Canister purge hose
- Brake booster hose

7. Disconnect fuel feed and return hoses from each pipe.

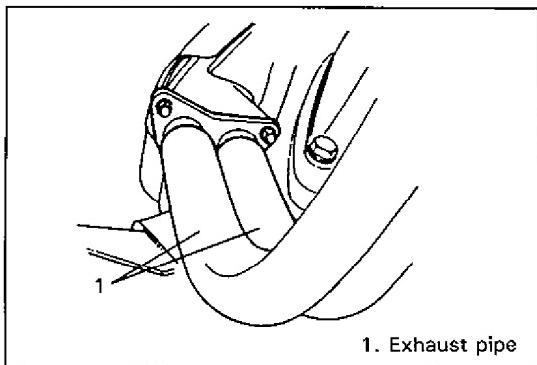
8. Remove cylinder head cover as previously outlined.
Loosen all valve lash adjusting screws fully.

9. Disconnect engine cooling water hoses:

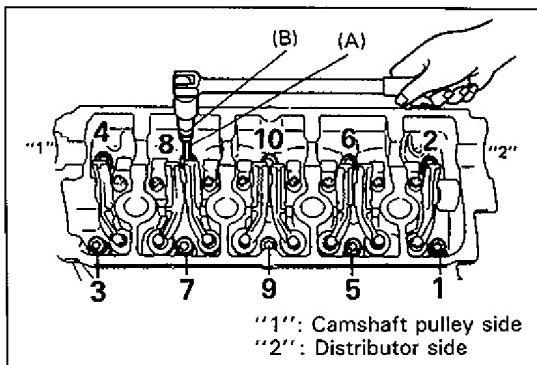
- Radiator inlet hose
- Heater inlet hose
- Throttle body outlet hose

10. Remove timing belt and camshaft as previously outlined.

60A50-6A1-49-1S



60A50-6A1-49-2S



60A50-6A1-49-3S

11. Disconnect exhaust pipe from exhaust manifold and remove exhaust manifold stiffener.

12. Loosen cylinder head bolts in such order as indicated in figure and remove them.

Special Tool

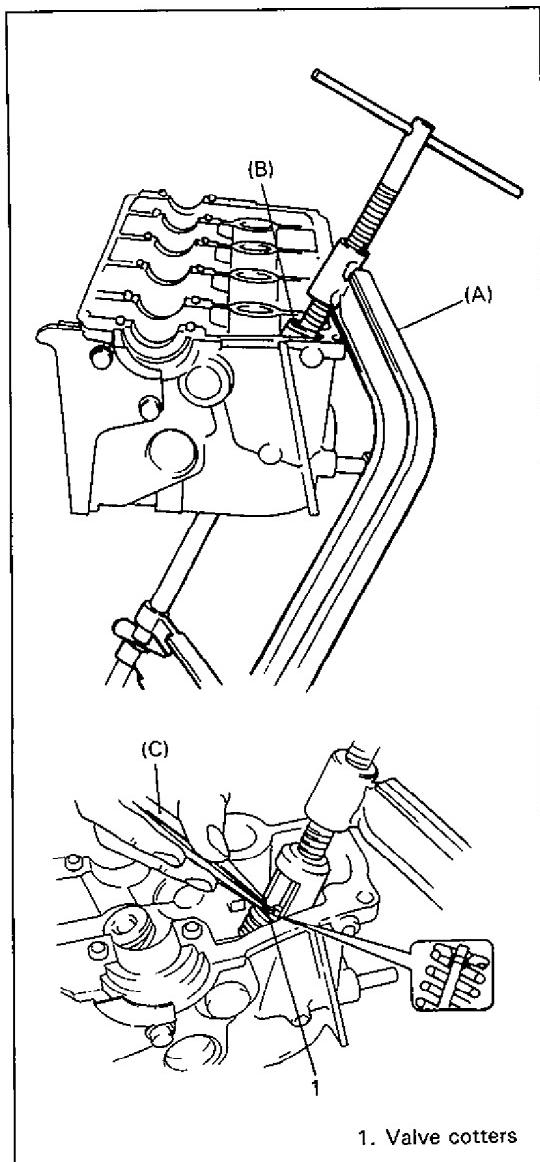
(A): 09900-00415

(B): 09900-00411

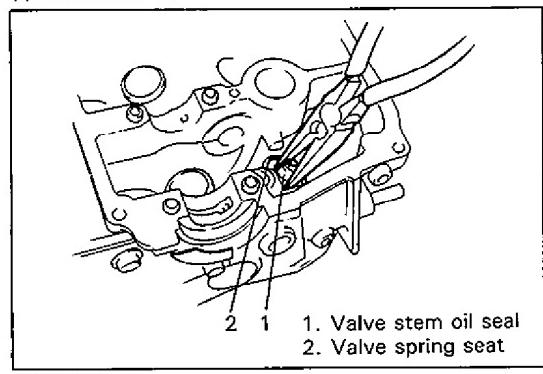
13. Check all around cylinder head for any other parts required to be removed or disconnected and remove or disconnect whatever necessary.

14. Remove cylinder head with intake manifold, exhaust manifold and distributor, using lifting device.

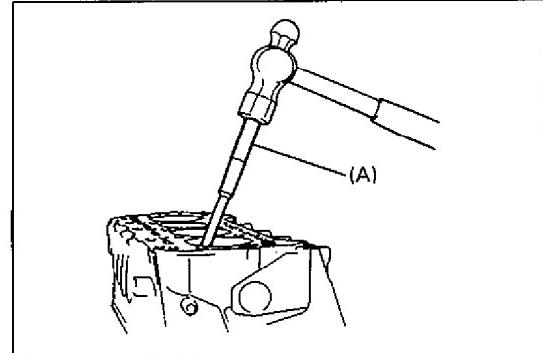
60A50-6A1-49-4S



60A50-6A1-50-1S



60A50-6A1-50-4S



60A50-6A1-50-5S

DISASSEMBLY

- For ease in servicing cylinder head, remove distributor gear case, intake manifold with throttle body and exhaust manifold from cylinder head.
- Remove rocker arms and washers by pulling its shaft out to transmission side.
- Using special tool (Valve lifter), compress valve springs and then remove valve coppers by using special tool (Foresps) as shown.
- Release special tool, and remove spring retainer and valve spring.
- Remove valve from combustion chamber side.

Special Tool

(A): 09916-14510

(B): 09916-14910

(C): 09916-84510

- Remove valve stem oil seal from valve guide, and then valve spring seat.

NOTE:

Do not reuse oil seal once disassembled. Be sure to use new oil seal when assembling.

- Using special tool (Valve guide remover), drive valve guide out from combustion chamber side to valve spring side.

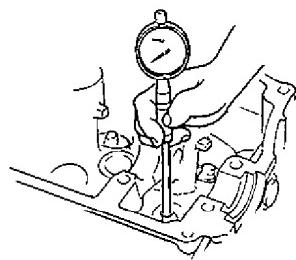
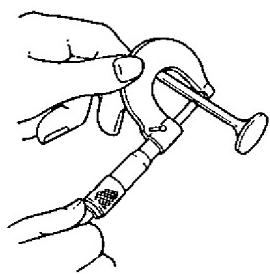
Special Tool

(A): 09916-44910

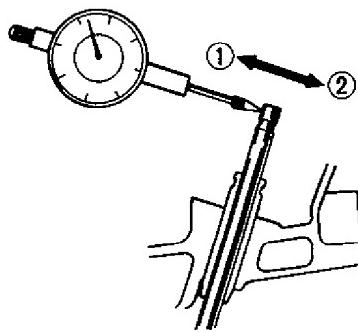
NOTE:

Do not reuse valve guide once disassembled. Be sure to use new valve guide (Oversize) when assembling.

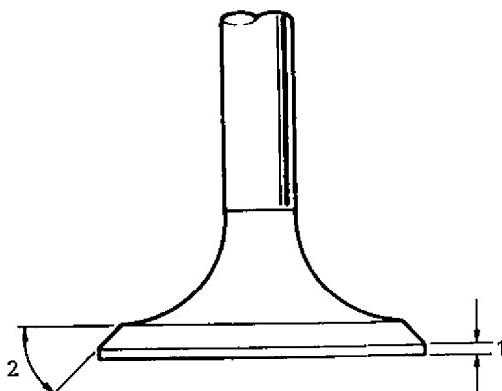
- Place disassembled parts except valve stem seal and valve guide in order, so that they can be installed in their original position.



60A50-6A1-51-1S



60A50-6A1-51-3S

1. Valve head thickness
2. 45°

INSPECTION

Valve Guides

Using a micrometer and bore gauge, take diameter readings on valve stems and guides to check stem-to-guide clearance. Be sure to take reading at more than one place along the length of each stem and guide.

If clearance exceeds limit, replace valve and valve guide.

Item	Standard		Limit
Valve stem diameter	In	5.465–5.480 mm (0.2152–0.2157 in.)	—
	Ex	5.440–5.455 mm (0.2142–0.2148 in.)	—
Valve guide I.D.	In	5.500–5.512 mm (0.2166–0.2170 in.)	—
	Ex	—	—
Stem-to-guide clearance	In	0.020–0.047 mm (0.0008–0.0018 in.)	0.07 mm (0.0027 in.)
	Ex	0.045–0.072 mm (0.0018–0.0028 in.)	0.09 mm (0.0035 in.)

If bore gauge is not available, check end deflection of valve stem with a dial gauge instead.

Move stem end in directions ① and ② to measure end deflection.

If deflection exceeds its limit, replace valve stem and valve guide.

Valve stem end deflection limit	In	0.14 mm (0.005 in.)
	Ex	0.18 mm (0.007 in.)

Valves

- Remove all carbon from valves.
- Inspect each valve for wear, burn or distortion at its face and stem and, as necessary, replace it.
- Measure thickness of valve head. If measured thickness exceeds limit, replace valve.

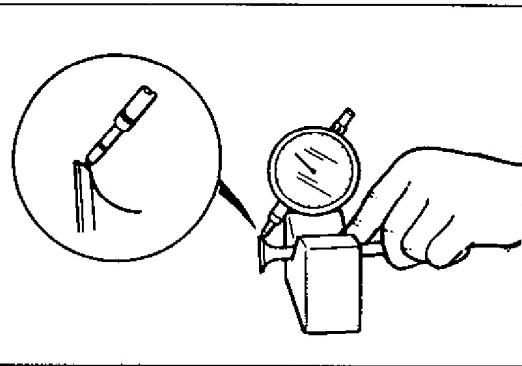
Valve head thickness		
	Standard	Limit
IN	0.8–1.2 mm (0.03–0.047 in.)	0.6 mm (0.024 in.)
		0.7 mm (0.027 in.)

60A50-6A1-51-4S



60A50-6A1-52-1S

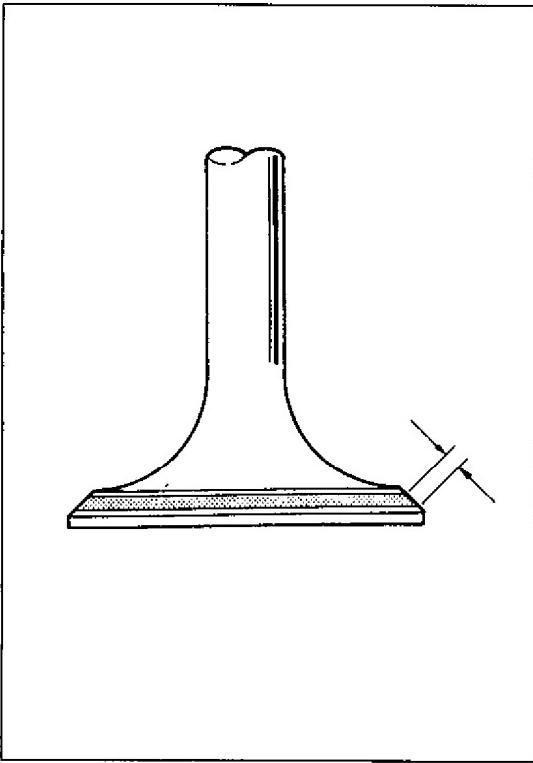
- Inspect valve stem end face for pitting and wear. If pitting or wear is found there, valve stem end may be resurfaced, but not so much as to grind off its chamfer. When it is worn so much that its chamfer is gone, replace valve.



60A50-6A1-52-2S

- Check each valve for radial runout with a dial gauge and "V" block. To check runout, rotate valve slowly. If runout exceeds its limit, replace valve.

Limit on valve head radial runout:
0.08 mm (0.003 in.)



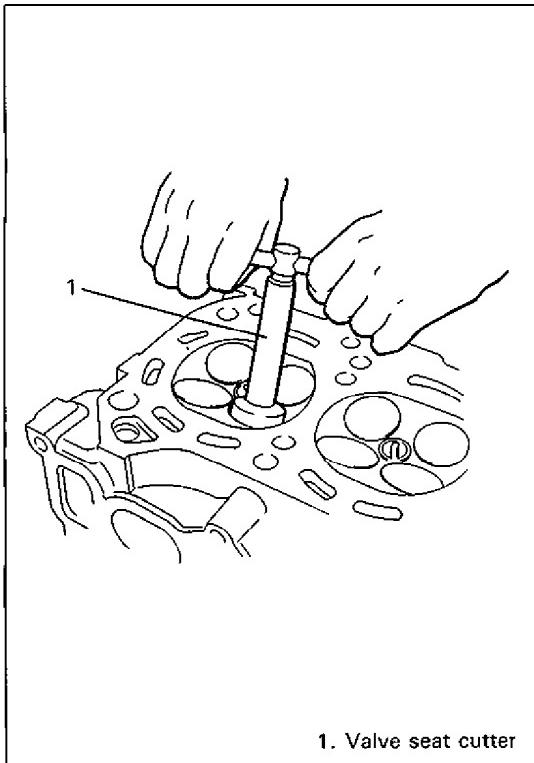
60A50-6A1-52-3S

- Seating contact width:

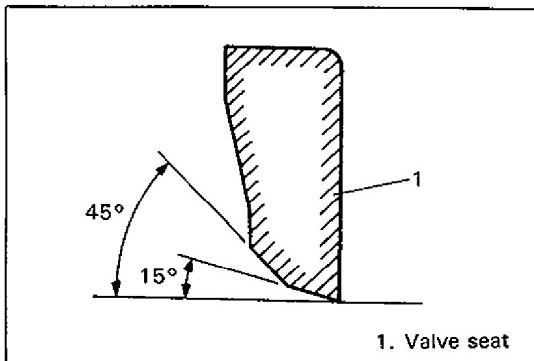
Create contact pattern on each valve in the usual manner, i.e., by giving uniform coat of marking compound to valve seat and by rotatingly tapping seat with valve head. Valve lapper (tool used in valve lapping) must be used.

Pattern produced on seating face of valve must be a continuous ring without any break, and the width of pattern must be within specified range.

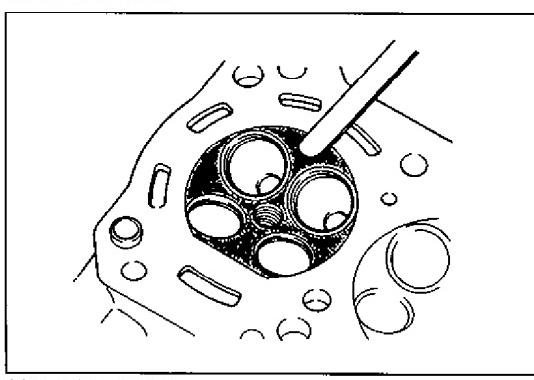
Standard seating width revealed by contact pattern on valve face	In	1.1–1.3 mm
	Ex	(0.0433–0.0512 in.)



60A50-6A1-53-1S



60A60-6A1-53-3S



60A50-6A1-53-4S

- **Valve seat repair:**

A valve seat not producing a uniform contact with its valve or showing width of seating contact that is out of specified range must be repaired by regrinding or by cutting and regrinding and finished by lapping.

1. **EXHAUST VALVE SEAT:** Use valve seat cutters to make two cuts as illustrated in figure. Two cutters must be used: the first for making 15° angle, and the second for making 45° angle. The second cut must be made to produce desired seat width.

Seat width for exhaust valve seat:

1.1–1.3 mm (0.0433–0.0512 in.)

2. **INTAKE VALVE SEAT:** Cutting sequence is the same as for exhaust valve seats.

Seat width for intake valve seat:

1.1–1.3 mm (0.0433–0.0512 in.)

3. **VALVE LAPPING:** Lap valve on seat in two steps, first with coarse size lapping compound applied to face and the second with fine-size compound, each time using valve lapper according to usual lapping method.

Cylinder Head

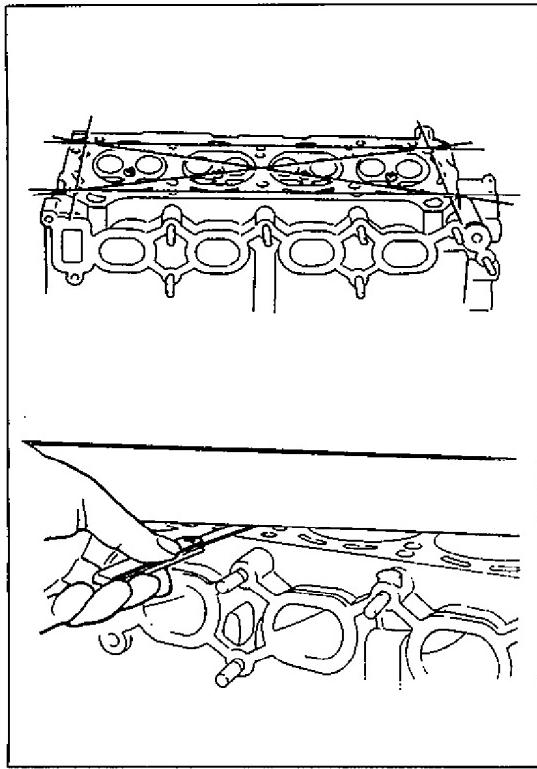
- Remove all carbon from combustion chambers.

NOTE:

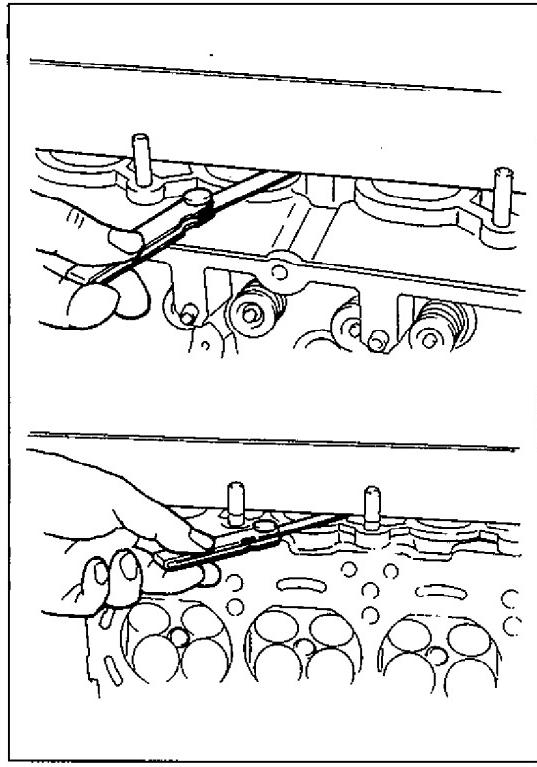
Do not use any sharp-edged tool to scrape off carbon. Be careful not to scuff or nick metal surfaces when decarboning. The same applies to valves and valve seats, too.

- Check cylinder head for cracks in intake and exhaust ports, combustion chambers, and head surface.

60A50-6A1-53-5S



60A50-6A1-54-1S



60A50-6A1-54-3S

- Flatness of gasketed surface:

Using a straightedge and thickness gauge, check surface at a total of 6 locations. If distortion limit, given below, is exceeded, correct gasketed surface with a surface plate and abrasive paper of about #400 (Waterproof silicon carbide abrasive paper): place paper on and over surface plate, and rub gasketed surface against paper to grind off high spots. Should this fail to reduce thickness gauge readings to within limit, replace cylinder head.

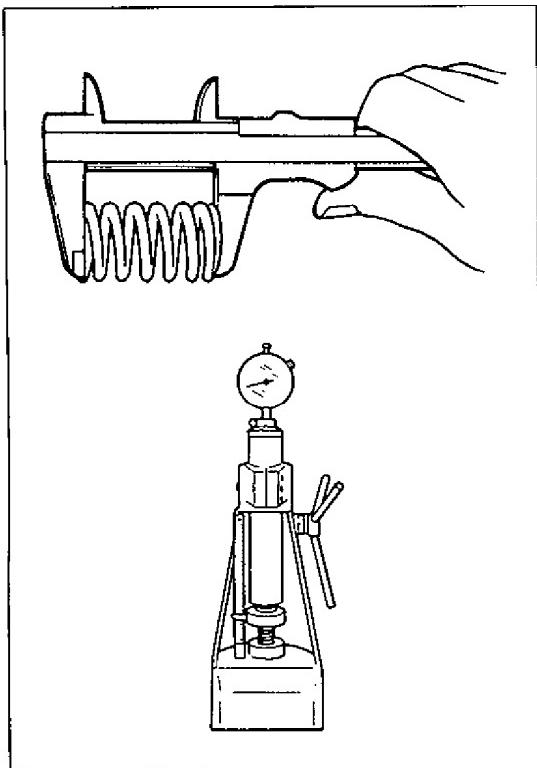
Leakage of combustion gases from this gasketed joint is often due to warped gasketed surface: such leakage results in reduced power output.

Limit of distortion: 0.05 mm (0.002 in.)

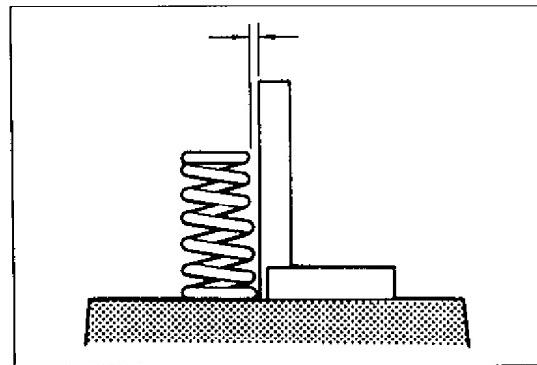
- Distortion of manifold seating faces:

Check seating faces of cylinder head for manifolds, using a straightedge and thickness gauge, in order to determine whether these faces should be corrected or cylinder head replaced.

Limit of distortion: 0.10 mm (0.004 in.)



60A50-6A1-55-1S



60A50-6A1-55-3S

Valve Springs

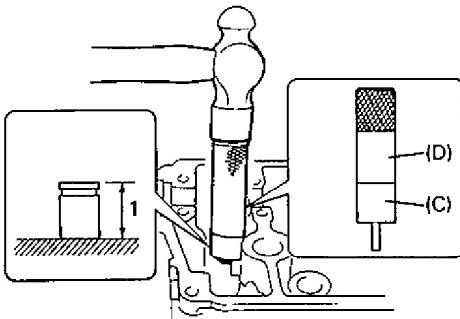
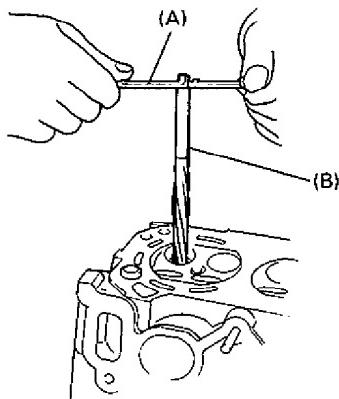
- Referring to data given below, check to be sure that each spring is in sound condition, free of any evidence of breakage or weakening. Remember, weakened valve springs can cause chatter, not to mention possibility of reducing power output due to gas leakage caused by decreased seating pressure.

Item	Standard	Limit
Valve spring free length	36.44 mm (1.4346 in.)	35.30 mm (1.3897 in.)
Valve spring preload	13.3–15.7 kg for 31.5 mm (29.4–34.6 lb/ 1.24 in.)	11.6 kg for 31.5 mm (25.6 lb/ 1.24 in.)

- Spring squareness:

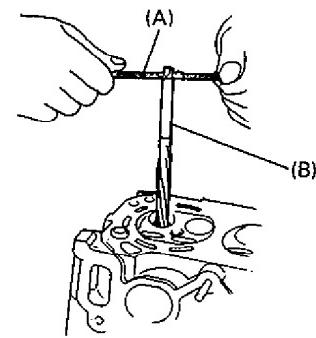
Use a square and surface plate to check each spring for squareness in terms of clearance between end of valve spring and square. Valve springs found to exhibit a larger clearance than limit given below must be replaced.

Valve spring squareness limit: 2.0 mm (0.079 in.)



1. Valve guide protrusion (11.5 mm)

60A50-6A1-56-1S



60A50-6A1-56-4S

ASSEMBLY

- Before installing valve guide into cylinder head, ream guide hole with special tool (11 mm reamer) so remove burrs and make it truly round.

Special Tool

(A): 09916-34541

(B): 09916-38210

- Install valve guide to cylinder head.

Heat cylinder head uniformly at a temperature of 80 to 100°C (176 to 212°F) so that head will not be distorted, and drive new valve guide into hole with special tools. Drive in new valve guide until special tool (Valve guide installer) contacts cylinder head.

After installing, make sure that valve guide protrudes by 11.5 mm (0.45 in.) from cylinder head.

Special Tool

(C): 09916-56011

(D): 09916-58210

NOTE:

- Do not reuse valve guide once disassembled.
Install new valve guide (Oversize).
- Intake and exhaust valve guides are identical.

Valve guide oversize: 0.03 mm (0.0012 in.)

Valve guide protrusion (In and Ex): 11.5 mm (0.45 in.)

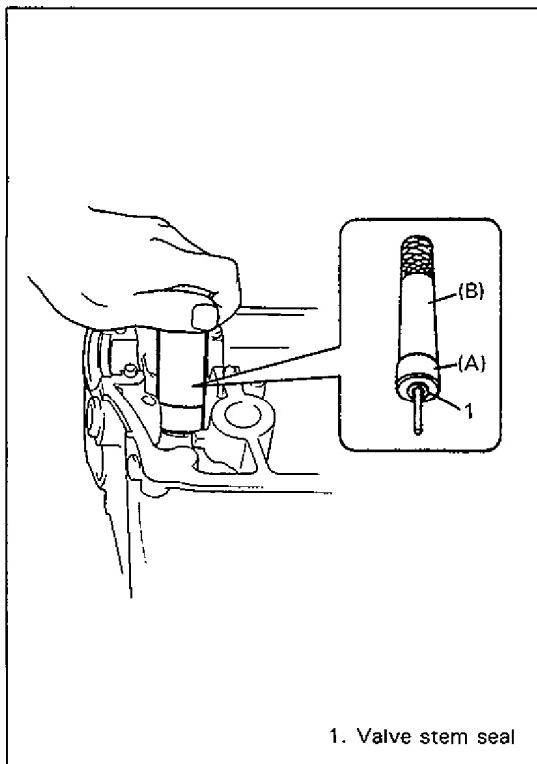
- Ream valve guide bore with special tool (5.5 mm reamer). After reaming, clean bore.

Special Tool

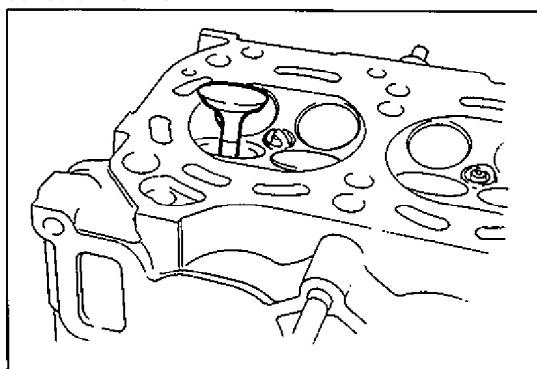
(A): 09916-34541

(B): 09916-34550

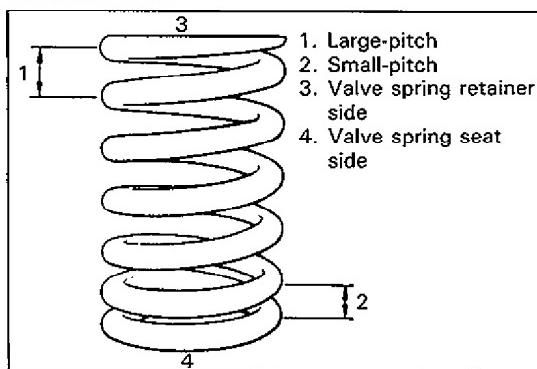
- Install valve spring seat to cylinder head.



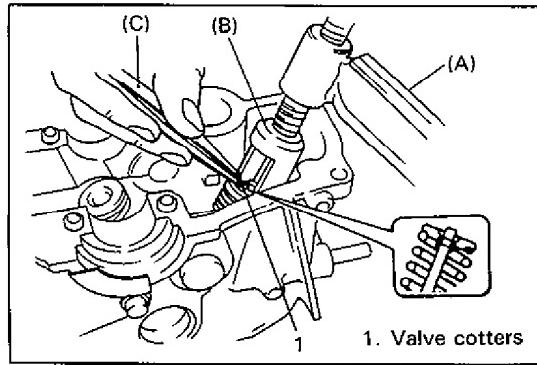
60A50-6A1-57-1S



60A50-6A1-57-3S



60A50-6A1-57-4S



60A50-6A1-57-5S

5. Install new valve stem seal to valve guide.

After applying engine oil to seal and spindle of special tool (Valve guide installer handle), fit oil seal to spindle, and then install seal to valve guide by pushing special tool by hand.

After installing, check to be sure that seal is properly fixed to valve guide.

Special Tool

(A): 09917-98221

(B): 09916-58210

NOTE:

- Do not reuse seal once disassembled. Be sure to install new seal.
- When installing, never tap or hit special tool with a hammer or else. Install seal to guide only by pushing special tool by hand. Tapping or hitting special tool may cause damage to seal.

6. Install valve to valve guide.

Before installing valve to valve guide, apply engine oil to stem seal, valve guide bore, and valve stem.

7. Install valve spring and spring retainer.

Each valve spring has top end (large-pitch end) and bottom end (small-pitch end). Be sure to position spring in place with its bottom end (small-pitch end) facing the bottom (valve spring seat side).

8. Using special tool (Valve lifter), compress valve spring and fit two valve cotters into groove in valve stem.

Special Tool

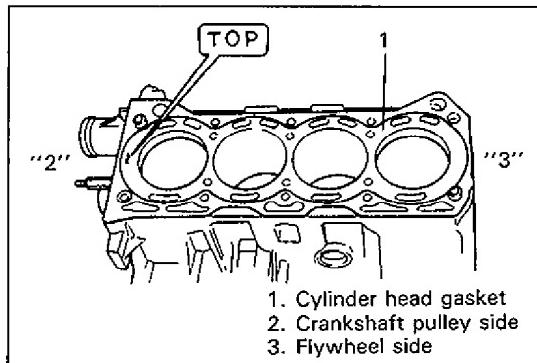
(A): 09916-14510

(B): 09916-14910

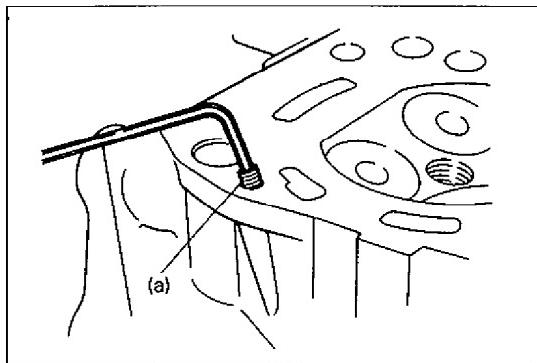
(C): 09916-84510

9. Install rocker arms, washers, rocker arm shaft and cam-shaft as previously outlined.
10. Install distributor gear case, intake manifold and exhaust manifold.

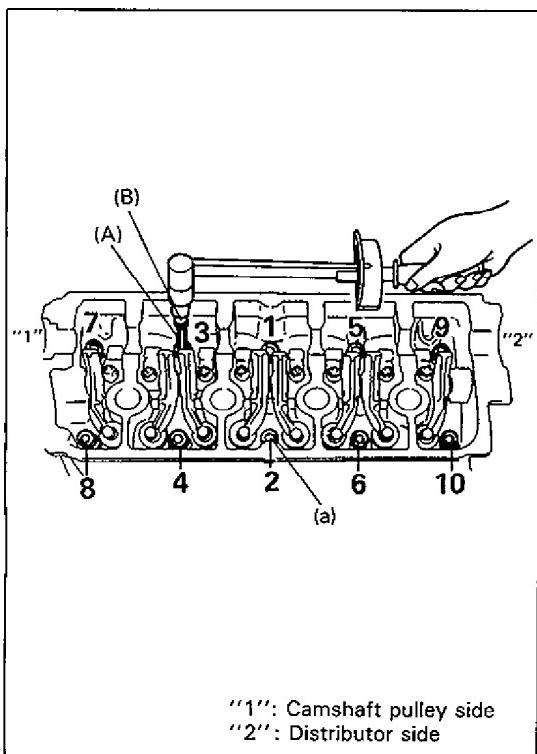
60A50-6A1-58-1S



60A50-6A1-58-2S



60A50-6A1-58-3S



INSTALLATION

1. Remove oil gasket and oil on mating surfaces and install new head gasket as shown in figure, that is, "TOP" mark provided on gasket comes to crankshaft pulley side, facing up (toward cylinder head side).

2. Check to make sure that oil jet (venturi plug) is installed and if it is, that it is not clogged.
When installing it, be sure to tighten to specified torque.

Tightening Torque

(a): 4–6 N·m (0.4–0.6 kg-m, 3.0–4.0 lb-ft)

3. Apply engine oil to cylinder head bolts and tighten them gradually as follows.

- 1) Tighten all bolts to 35 N·m (3.5 kg-m, 25.0 lb-ft) according to numerical order in figure.
- 2) In the same manner as in 1), tighten them to 55 N·m (5.5 kg-m, 40.0 lb-ft).
- 3) In the same manner as in 1) again, tighten them to specified torque.

Tightening Torque

(a): 65–70 N·m (6.5–7.0 kg-m, 47.5–50.5 lb-ft)

Special Tool

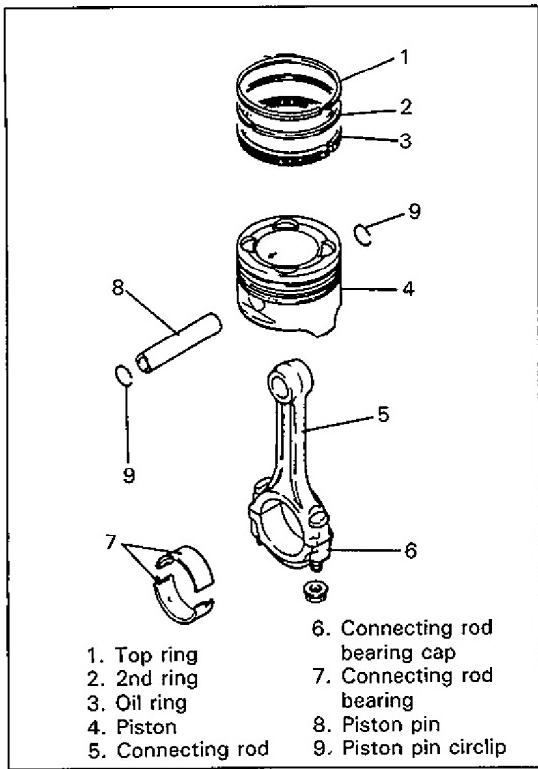
(A): 09900-00415

(B): 09900-00411

60A50-6A1-58-4S

4. Reverse removal procedure for installation.
5. Adjust water pump drive belt tension, referring to "ENGINE COOLING" section.
6. Adjust power steering pump belt tension or A/C compressor belt tension, if equipped.
Refer to Section OB.
7. Adjust intake and exhaust valve lashes as previously outlined.
8. Adjust accelerator cable play and A/T throttle cable play.
Refer to Section 6E1.
9. Check to ensure that all removed parts are back in place.
Reinstall any necessary parts which have not been reinstalled.
10. Refill cooling system referring to Section 6C.
11. Connect negative cable at battery.
12. Adjust ignition timing referring to Section 6F1.
13. Verify that there is no fuel leakage, water leakage and exhaust gas leakage at each connection.

PISTON, PISTON RINGS, CONNECTING RODS AND CYLINDERS

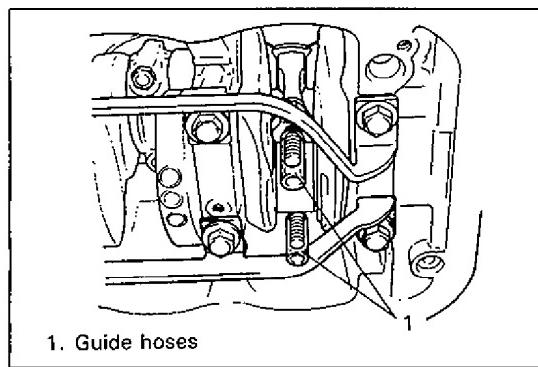


60A50-6A1-60-1S

REMOVAL

1. Remove cylinder head from cylinder block as previously outlined.
2. Drain engine oil.
3. Remove oil pan and oil pump strainer as previously outlined.
4. Mark cylinder number on all pistons, connecting rods and rod bearing caps, using silver pencil or quick drying paint.

60A50-6A1-60-3S



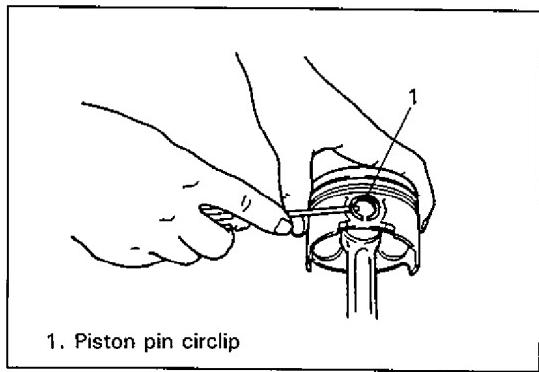
60A50-6A1-60-4S

5. Remove rod bearing caps.
6. Install guide hose over threads of rod bolts.
This is to prevent damage to bearing journal and rod bolt threads when removing connecting rod.
7. Decarbon top of cylinder bore before removing piston from cylinder.
8. Push piston and connecting rod assembly out through the top of cylinder bore.

DISASSEMBLY

1. Using piston ring expander, remove two compression rings (Top and 2nd) and oil ring from piston.

60A50-6A1-61-1S

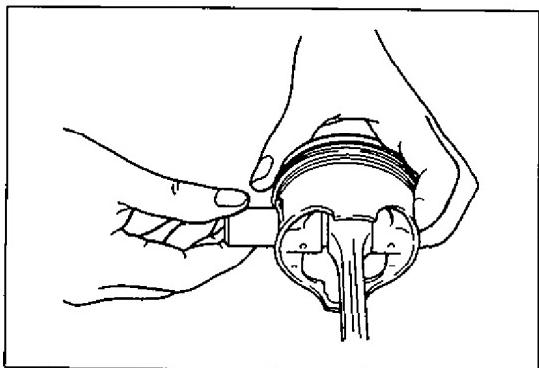


1. Piston pin circlip

2. Remove piston pin from connecting rod.

- Ease out piston pin circlips, as shown.

60A50-6A1-61-2S



- Force piston pin out.

60A50-6A1-61-3S

CLEANING

Clean carbon from piston head and ring grooves, using a suitable tool.

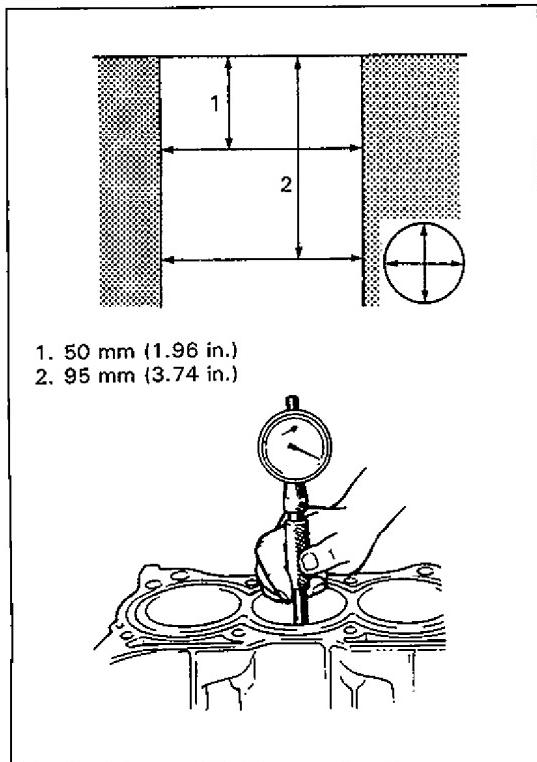
60A50-6A1-61-4S

INSPECTION

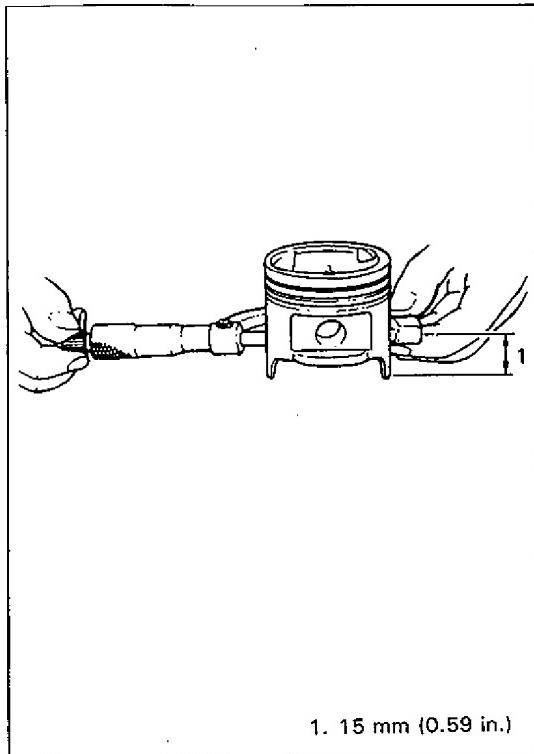
Cylinders

- Inspect cylinder walls for scratches, roughness, or ridges which indicate excessive wear. If cylinder bore is very rough or deeply scratched, or ridged, rebore cylinder and use oversize piston.

60A50-6A1-62-1S



60A50-6A1-62-2S



- Using a cylinder gauge, measure cylinder bore in thrust and axial directions at two positions as shown in figure. If any of following conditions is noted, rebore cylinder.
 1. Cylinder bore dia. exceeds limit.
 2. Difference of measurements at two positions exceeds taper limit.
 3. Difference between thrust and axial measurements exceeds out-of-round limit.

Cylinder bore dia. limit : 75.15 mm (2.9586 in.)

Taper and out-of-round limit: 0.10 mm (0.0039 in.)

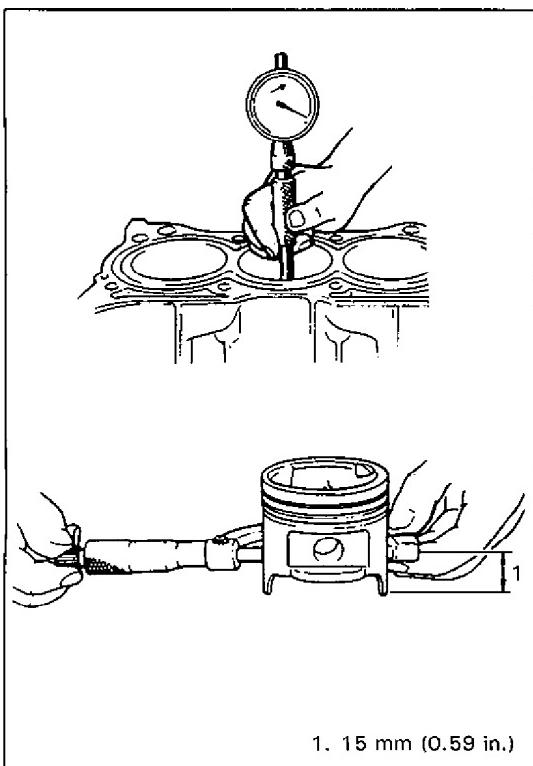
NOTE:

If any one of four cylinders has to be rebored, rebore all four to the same next oversize. This is necessary for the sake of uniformity and balance.

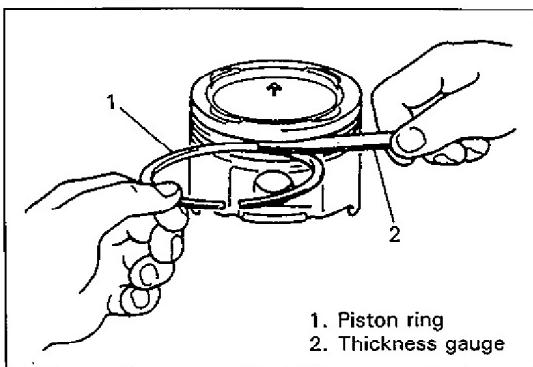
Pistons

- Inspect piston for faults, cracks or other damaged. Damaged or faulty piston shosuld be replaced.
- Piston diameter:
As indicated in figure, piston diameter should be measured at a position 15 mm (0.59 in.) from piston skirt end in the direction perpendicular to piston pin.

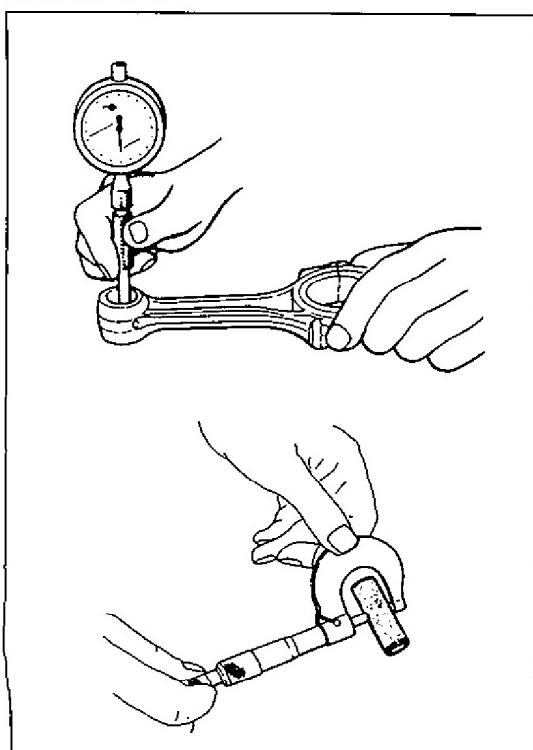
Piston diameter	Standard	74.970–74.990 mm (2.9516–2.9523 in.)
	Oversize: 0.25 mm (0.0098 in.)	75.220–75.230 mm (2.9614–2.9618 in.)
	0.50 mm (0.0196 in.)	75.470–75.480 mm (2.9712–2.9716 in.)



60A50-6A1-63-1S



60A50-6A1-63-3S



60A50-6A1-63-4S

- **Piston clearance:**

Measure cylinder bore diameter and piston diameter to find their difference which is piston clearance. Piston clearance should be within specification as given below. If it is out of specification, re bore cylinder and use oversize piston.

Piston clearance: 0.02–0.04 mm (0.0008–0.0015 in.)

NOTE:

Cylinder bore diameters used here are measured in thrust direction at two positions.

- **Ring groove clearance:**

Before checking, piston grooves must be clean, dry and free of carbon.

Fit new piston ring into piston groove, and measure clearance between ring and ring land by using thickness gauge. If clearance is out of specification, replace piston.

Ring groove clearance:

Top: 0.03–0.07 mm (0.0012–0.0027 in.)

2nd: 0.02–0.06 mm (0.0008–0.0023 in.)

Piston Pin

- Check piston pin, connecting rod small end bore and piston bore for wear or damage, paying particular attention to condition of small end bore bush. If pin, connecting rod small end bore or piston bore is badly worn or damaged, replace pin, connecting rod or piston.

- **Piston pin clearance:**

Check piston pin clearance in small end. Replace connecting rod if its small end is badly worn or damaged or if measured clearance exceeds limit.

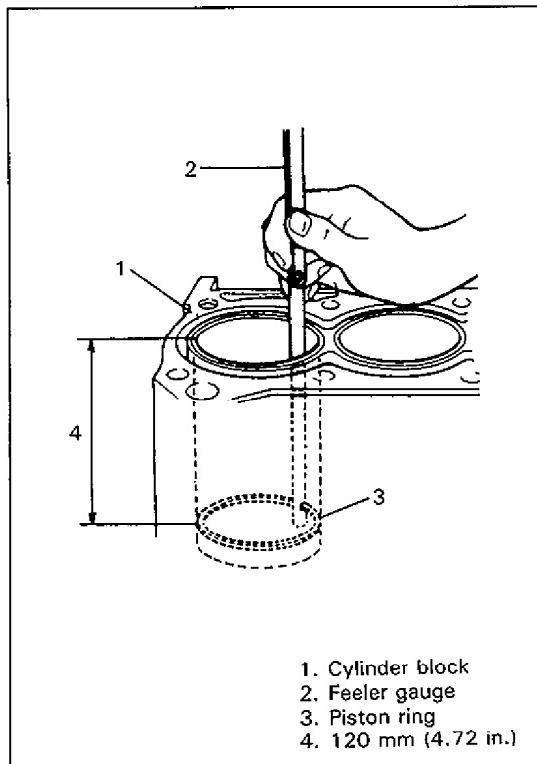
Item	Standard	Limit
Piston clearance in small end	0.003–0.016 mm (0.0001–0.0006 in.)	0.05 mm (0.0020 in.)

Small-end bore:

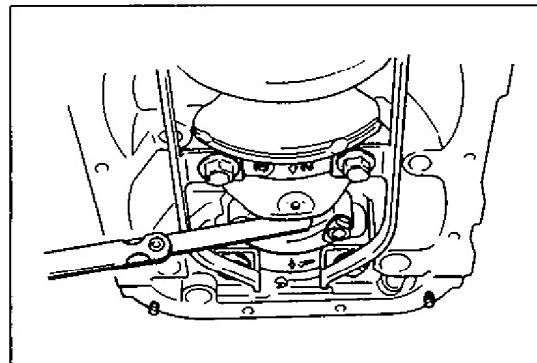
19.003–19.011 mm (0.7482–0.7486 in.)

Piston pin dia.:

18.995–19.000 mm (0.7479–0.7480 in.)



60A50-6A1-64-1S



60A50-6A1-64-3S

Piston Rings

To measure end gap, insert piston ring into cylinder bore and then measure the gap by using thickness gauge. If measured gap is out of specification, replace ring.

NOTE:

Decarbon and clean top of cylinder bore before inserting piston ring.

	Item	Standard	Limit
Piston ring end gap	Top ring	0.2–0.35 mm (0.0079–0.0137 in.)	0.7 mm (0.0275 in.)
	2nd ring	0.2–0.35 mm (0.0079–0.0137 in.)	0.7 mm (0.0275 in.)
	Oil ring	0.2–0.7 mm (0.0079–0.0275 in.)	1.7 mm (0.0669 in.)

Connecting Rod

- Big-end side clearance:

Check big-end of connecting rod for side clearance, with rod fitted and connected to its crank pin in the normal manner. If measured clearance is found to exceed its limit, replace connecting rod.

Item	Standard	Limit
Big-end side clearance	0.10–0.20 mm (0.0039–0.0078 in.)	0.35 mm (0.0137 in.)

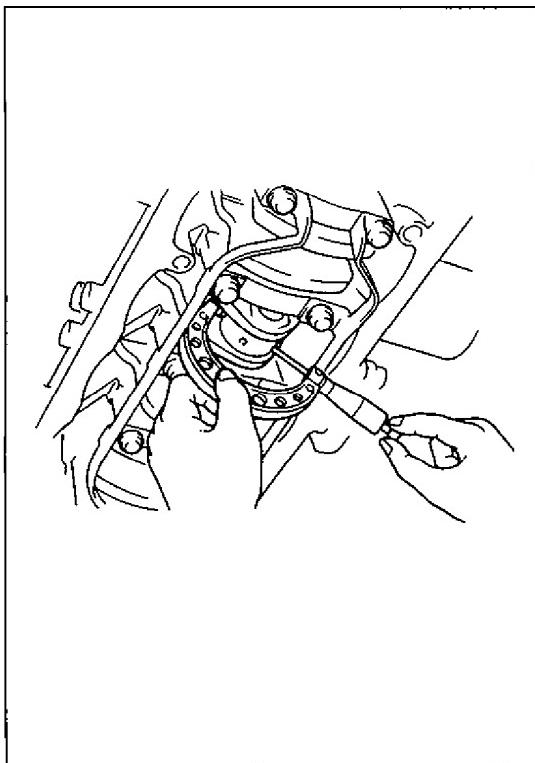
- Connecting rod alignment:

Mount connecting rod on aligner to check it for bow and twist and, if limit is exceeded, replace it.

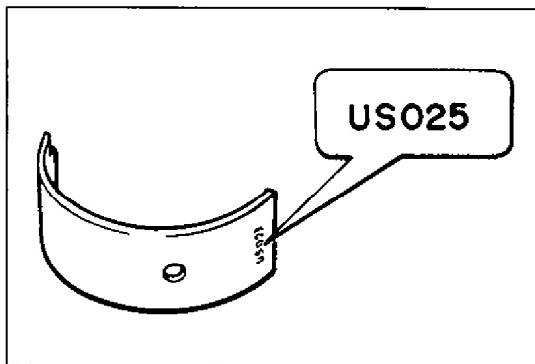
Limit on bow : 0.05 mm (0.0020 in.)

Limit on twist: 0.10 mm (0.0039 in.)

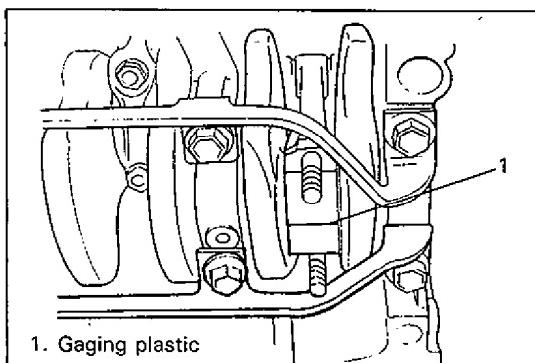
60A50-6A1-64-4S



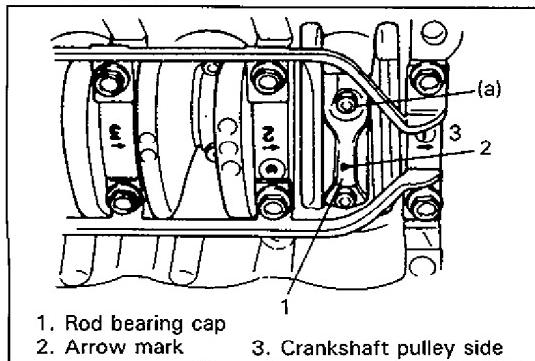
60A50-6A1-65-1S



60A50-6A1-65-3S



60A50-6A1-65-4S



60A50-6A1-65-5S

Crank Pin and Connecting Rod Bearings

- Inspect crank pin for uneven wear or damage. Measure crank pin for out-of-round or taper with a micrometer. If crank pin is damaged, or out-of-round or taper is out of limit, replace crankshaft or regrind crank pin to undersize and use undersize bearing.

Connecting rod bearing size	Crank pin diameter
Standard	43.982–44.000 mm (1.7316–1.7322 in.)
0.25 mm (0.0098 in.) undersize	43.732–43.750 mm (1.7218–1.7224 in.)

Out-of-round and taper limit: 0.01 mm (0.0004 in.)

- Rod bearing:

Inspect bearing shells for signs of fusion, pitting, burn or flaking and observe contact pattern. Bearing shells found in defective condition must be replaced.

Two kinds of rod bearing are available; standard size bearing and 0.25 mm undersize bearing. To distinguish them, 0.25 mm undersize bearing has the stamped number (US025) on its backside as indicated in figure, but standard size one has no number.

- Rod bearing clearance:

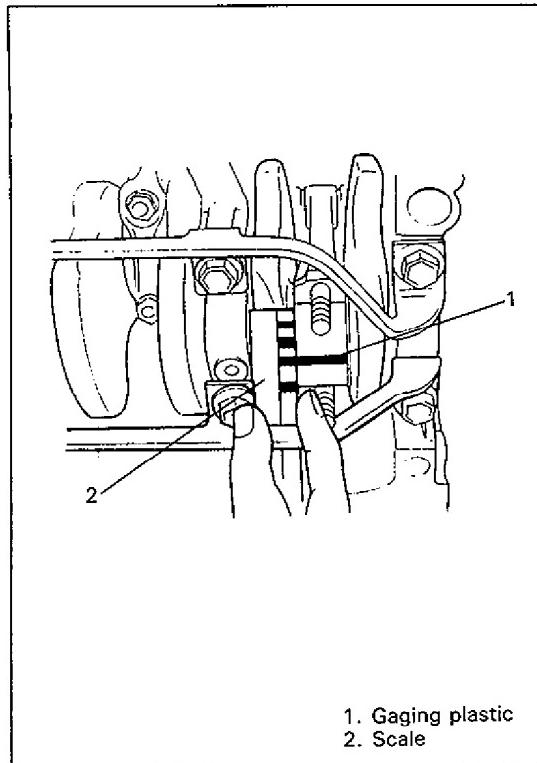
- Before checking bearing clearance, clean bearing and crank pin.
- Install bearing in connecting rod and bearing cap.
- Place a piece of gaging plastic to full width of crankpin as contacted by bearing (parallel to crankshaft), avoiding oil hole.

- Install rod bearing cap to connecting rod.

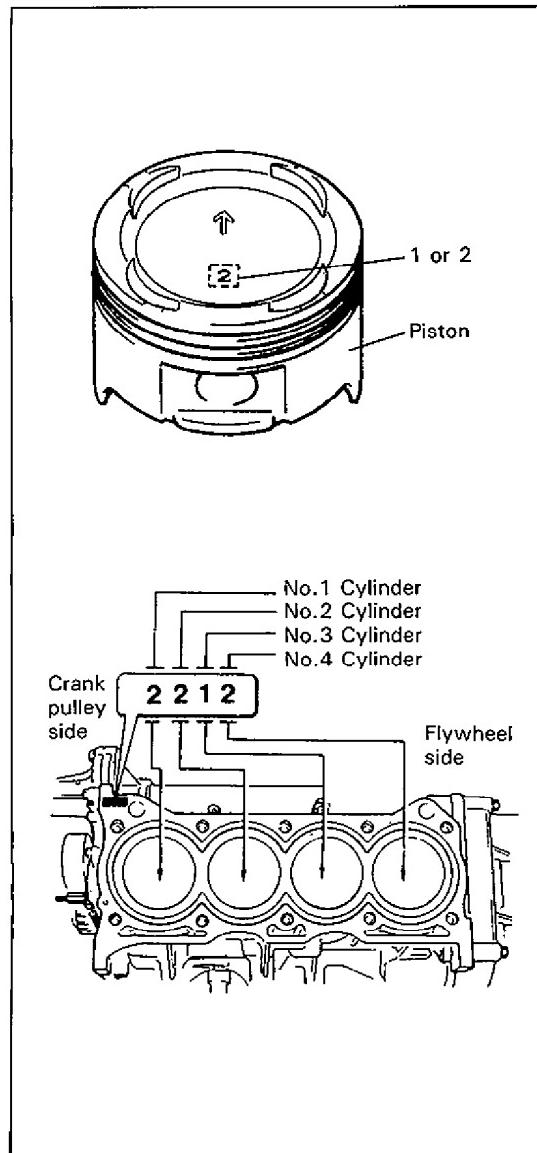
When installing cap, be sure to point arrow mark on cap to crankshaft pulley side, as shown in figure. After applying engine oil to rod bolts, tighten cap nuts to specified torque. DO NOT turn crankshaft with gaging plastic installed.

Tightening Torque

(a): 33–37 N·m (3.3–3.7 kg-m, 24.0–26.5 lb-ft)



60A50-6A1-66-1S



60A50-6A1-66-3S

5. Remove cap and using a scale on gaging plastic envelope, measure gaging plastic width at the widest point (clearance).

If clearance exceeds its limit, use a new standard size bearing and remeasure clearance.

Item	Standard	Limit
Bearing clearance	0.020–0.050 mm (0.0008–0.0019 in.)	0.080 mm (0.0031 in.)

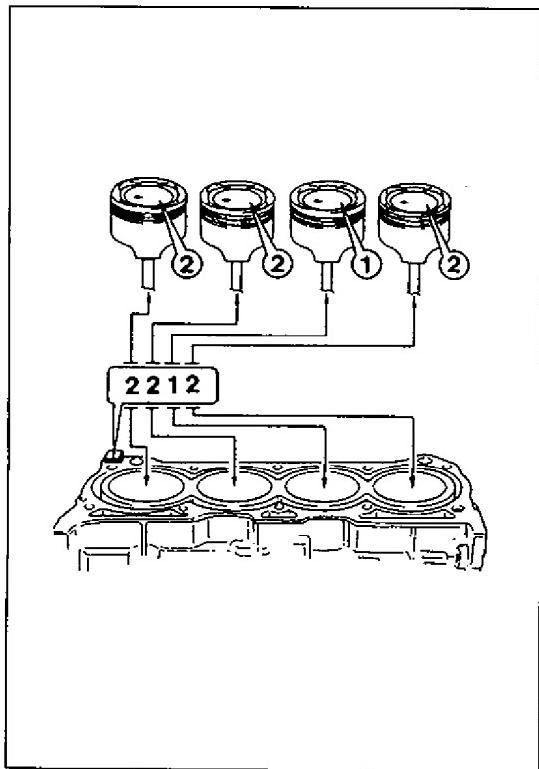
6. If clearance can not be brought to within its limit even by using a new standard size bearing, regrind crankpin to undersize and use 0.25 mm undersize bearing.

ASSEMBLY

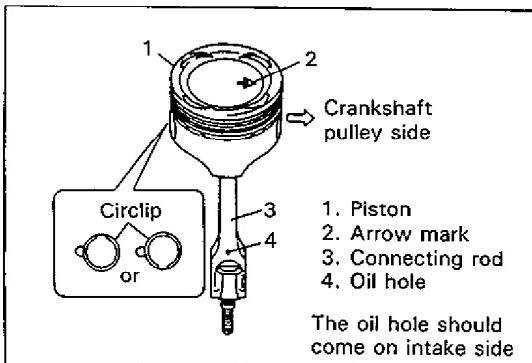
NOTE:

Two sizes of piston are available as standard size spare part so as to ensure proper piston-to-cylinder clearance. When installing a standard size piston, make sure to match piston with cylinder as follows.

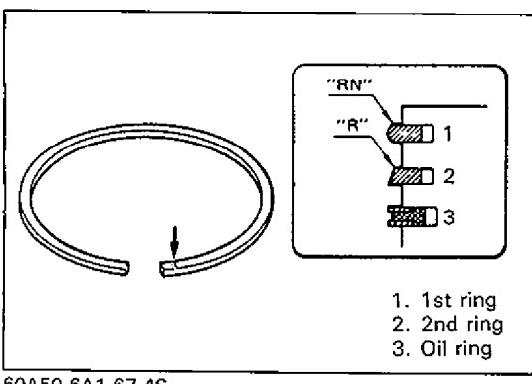
- a) Each piston has stamped number 1 or 2 as shown. It represents outer diameter of piston.
- b) There are also stamped numbers of 1 and 2 on the cylinder block as shown. The first number represents inner diameter of No.1 cylinder, the second number of No.2 cylinder, the third number of No.3 cylinder and the fourth number of No.4 cylinder.



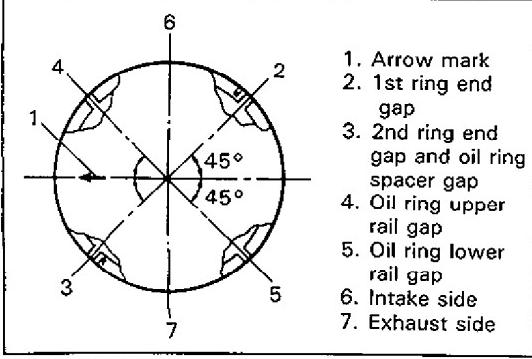
60A50-6A1-67-1S



60A50-6A1-67-3S



60A50-6A1-67-4S



60A50-6A1-67-5S

- c) Stamped number on piston and that on cylinder block should correspond. That is, install number 2 stamped piston to cylinder which is identified with number 2 and a number 1 piston to cylinder with number 1.

Piston		Cylinder		Piston-to-cylinder clearance
Number at the top (mark)	Outer diameter	Number (mark)	Bore diameter	
1	74.98–74.99 mm (2.9520–2.9524 in.)	1	75.01–75.02 mm (2.9531–2.9535 in.)	0.02–0.04 mm (0.0008–0.0015 in.)
2	74.97–74.98 mm (2.9516–2.9520 in.)	2	75.00–75.01 mm (2.9528–2.9531 in.)	0.02–0.04 mm (0.0008–0.0015 in.)

Also, a letter A, B or C is stamped on piston head but ordinarily it is not necessary to discriminate each piston by this letter.

1. Install piston pin to piston and connecting rod:

After applying engine oil to piston pin and piston pin holes in piston and connecting rod, fit connecting rod to piston as shown in figure and insert piston pin to piston and connecting rod, and install piston pin circlips.

NOTE:

Circlip should be installed with its cut part facing either up or down as shown in figure.

2. Install piston rings to piston:

- As indicated in figure at the left, 1st and 2nd rings have "RN", "T" or "R" mark respectively. When installing these piston rings to piston, direct marked side of each ring toward top of piston.
- 1st ring differs from 2nd ring in thickness, shape and color of surface contacting cylinder wall. Distinguish 1st ring from 2nd ring by referring to figure.
- When installing oil ring, install spacer first and then two rails.

3. After installing three rings (1st, 2nd and oil rings), distribute their end gaps as shown in figure.

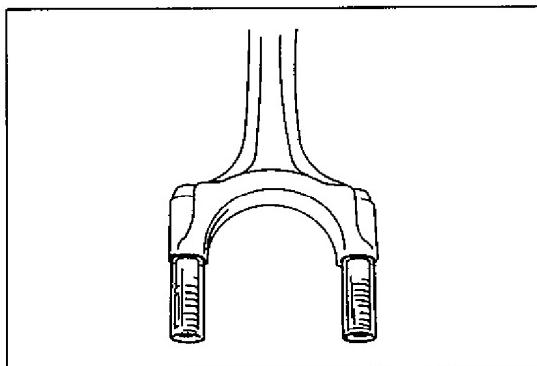
INSTALLATION OR CONNECTION

1. Apply engine oil to pistons, rings, cylinder walls, connecting rod bearings and crankpins.

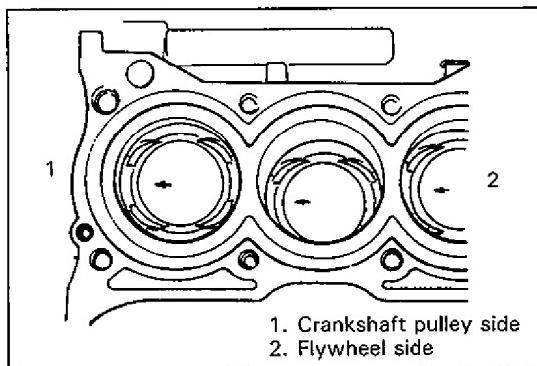
NOTE:

Do not apply oil between connecting rod and bearing or between bearing cap and bearing.

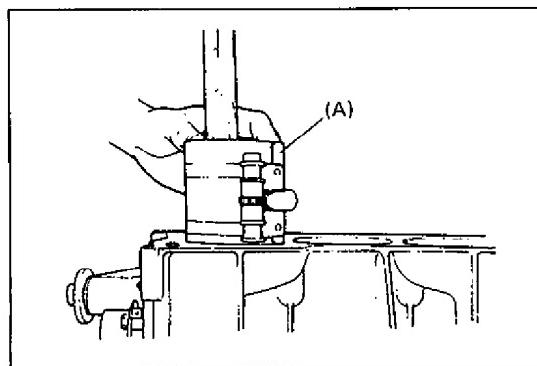
60A50-6A1-68-1S



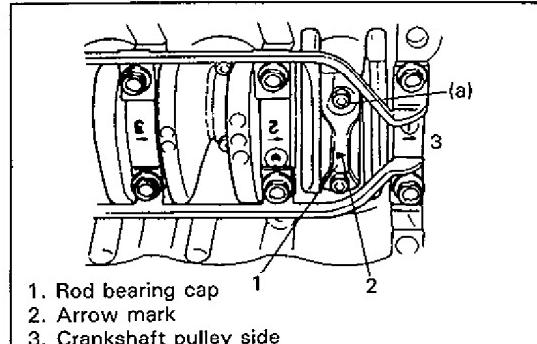
60A50-6A1-68-2S



60A50-6A1-68-3S



60A50-6A1-68-4S



2. Install guide hoses over connecting rod bolts. These guide hoses protect crankpin and threads of rod bolt from damage during installation of connecting rod and piston assembly.

3. When installing piston and connecting rod assembly into cylinder bore, point arrow mark on piston head to crankshaft pulley side.

4. Install piston and connecting rod assembly into cylinder bore. Use special tool (Piston ring compressor) to compress rings. Guide connecting rod into place on crankshaft. Using a hammer handle, tap piston head to install piston into bore. Hold ring compressor firmly against cylinder block until all piston rings have entered cylinder bore.

Special Tool

(A): 09916-77310

5. Install bearing cap:

Point arrow mark on cap to crankshaft pulley side. Tighten cap nuts to specification.

Tightening Torque

(a): 33–37 N·m (3.3–3.7 kg·m, 24.0–26.5 lb·ft)

60A50-6A1-68-5S

6. Reverse removal procedure for installation, as previously outlined.
7. Adjust water pump drive belt tension, referring to "ENGINE COOLING" section.
8. Adjust power steering pump belt tension or A/C compressor belt tension, if equipped.
Refer to Section OB.
9. Adjust accelerator cable play and A/T throttle cable play.
Refer to Section 6E1.
10. Check to ensure that all removed parts are back in place.
Reinstall any necessary parts which have not been reinstated.
11. Refill engine with engine oil, referring to item "ENGINE OIL CHANGE" in Section OB.
12. Refill cooling system referring to Section 6B.
13. Refill front differential housing with gear oil, referring to "DIFFERENTIAL" section.
14. Connect negative cable at battery.
15. Check ignition timing and adjust as necessary, referring to Section 6F1.
16. Verify that there is no fuel leakage, water leakage, oil leakage and exhaust gas leakage at each connection.

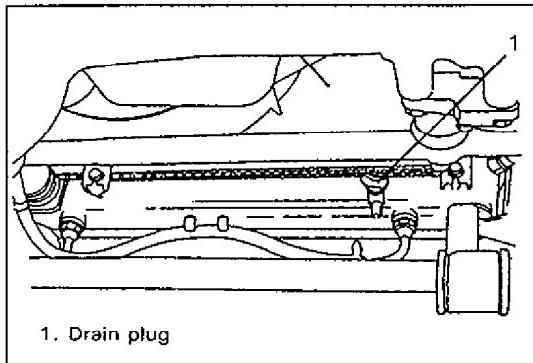
UNIT REPAIR OVERHAUL

ENGINE ASSEMBLY

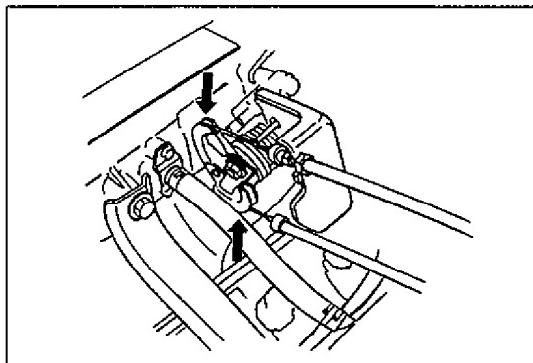
REMOVAL

1. Release fuel pressure in fuel feed line by referring to p. 6-4.
2. Remove battery.
3. Remove engine hood.

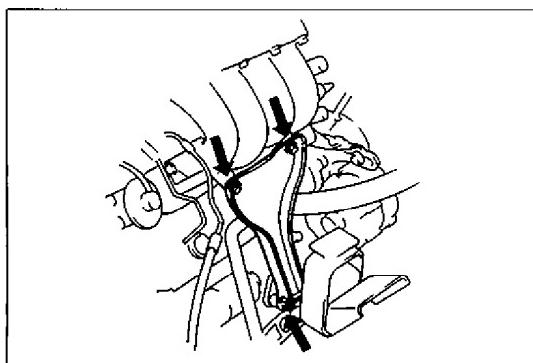
60A50-6A1-70-1S



60A50-6A1-70-2S



60A50-6A1-70-3S

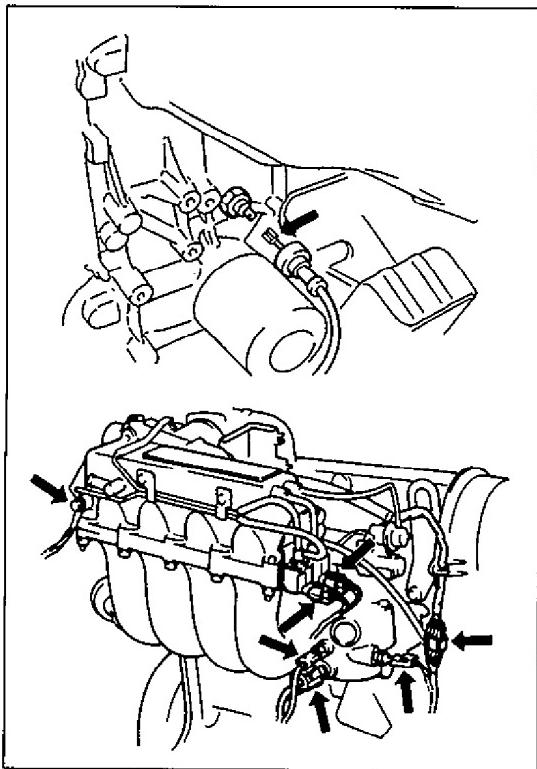


60A50-6A1-70-4S

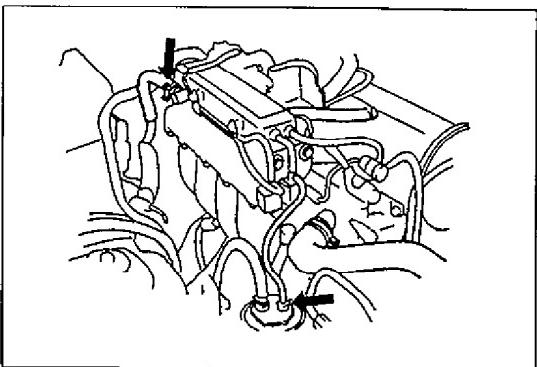
4. Drain cooling system
5. Remove radiator fan and fan shroud.
Refer to Section 6C.
6. Remove air intake pipe as previously outlined.

7. Disconnect accelerator cable and A/T throttle cable (if equipped) from throttle body.

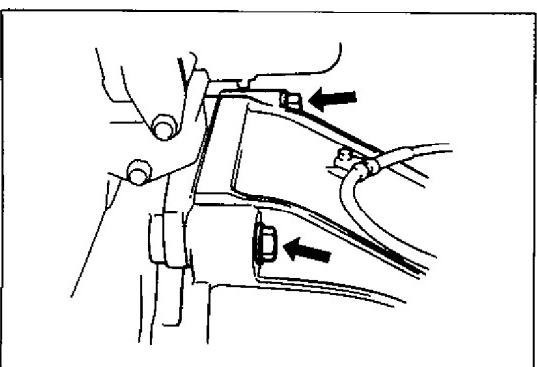
8. Remove intake manifold stiffener and then release wire harnesses from clamps.
9. Remove starter motor.



60A50-6A1-71-1S



60A50-6A1-71-3S



60A50-6A1-71-4S

10. Disconnect following electric wires:

- Distributor
 - Earth wires from surge tank
 - Engine oil pressure gauge
 - EGR VSV (if equipped)
 - Canister purge VSV
 - Water temp. gauge
 - WTS
 - A/C water temp. switch (if equipped)
 - Injectors, TSP and ISC valve wires at the coupler
 - Oxygen sensor (if equipped)
 - Alternator (generator)
 - Starter motor
- and then release wire harnesses from clamps.

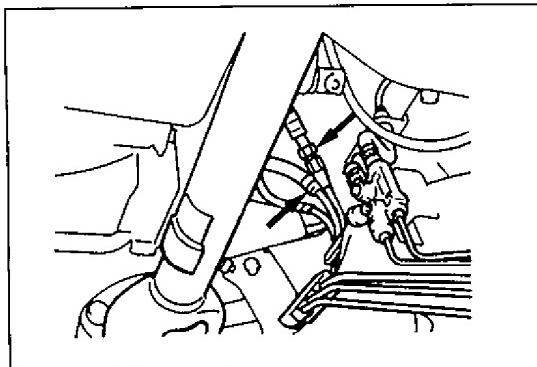
11. Disconnect following hoses:

- Canister purge hose from VSV
- Brake booster hose from surge tank
- Radiator outlet hose from inlet pipe
- Heater inlet and outlet hose from heater unit

12. Loosen bolts fastening cylinder block and transmission.

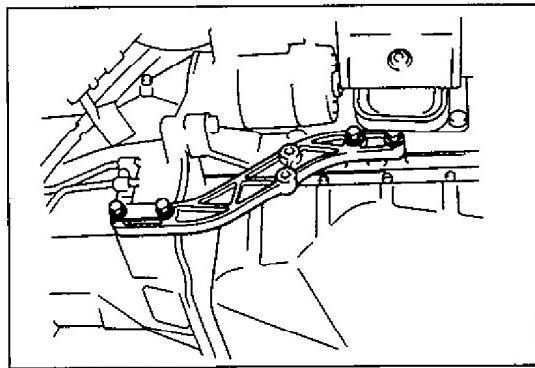
13. Hoist vehicle.

14. Drain engine oil.



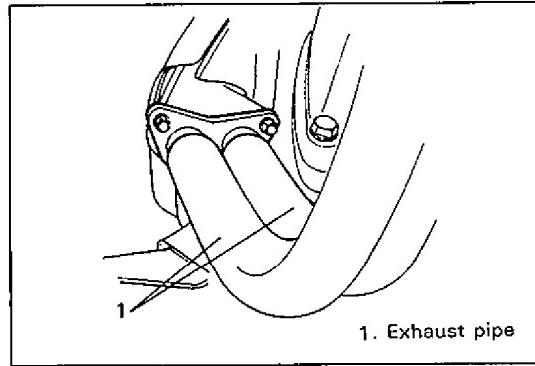
60A50-6A1-72-1S

15. Disconnect fuel feed and return hoses from pipes.



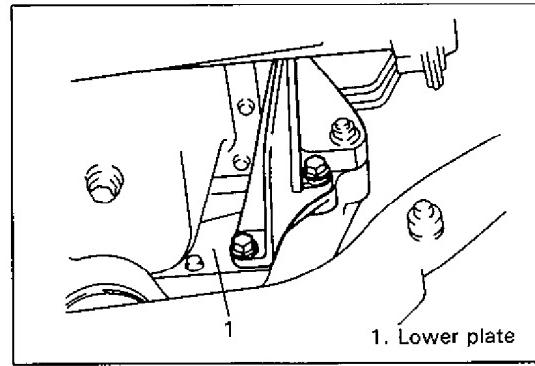
60A50-6A1-72-2S

16. Remove transmission stiffener (right side) and A/T fluid hose clamp bolt (A/T model).



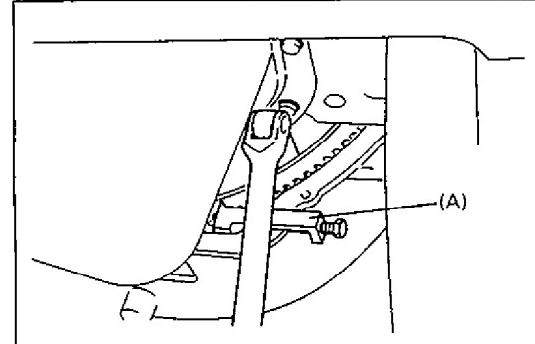
60A50-6A1-72-3S

17. Remove exhaust pipes.



60A50-6A1-72-4S

18. Remove transmission stiffener (left side) and then clutch housing (torque converter housing) lower plate.

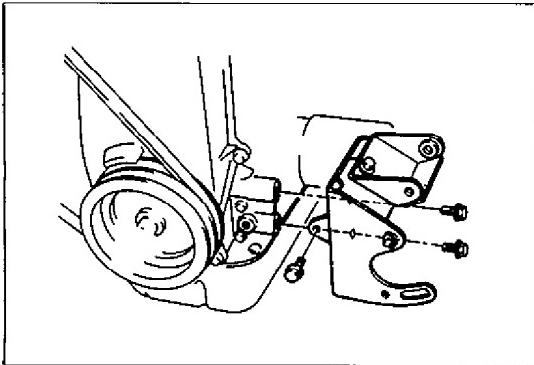


60A50-6A1-72-5S

19. Remove torque converter bolts (A/T model).

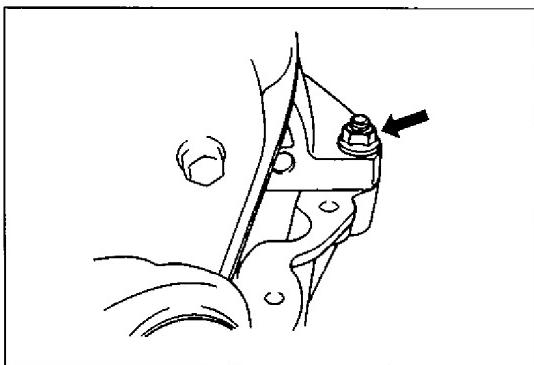
Special Tool

(A): 09927-56010



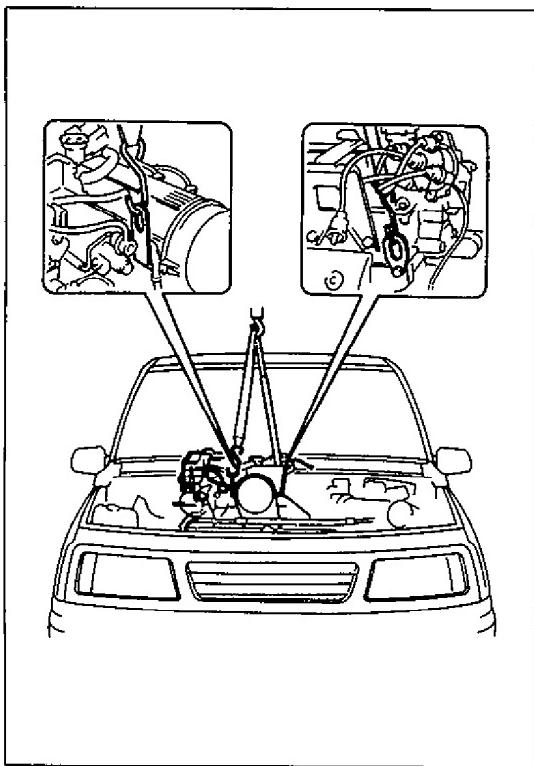
60A50-6A1-73-1S

20. With hoses connected, detach power steering pump and/or A/C compressor with bracket from cylinder block, if equipped.



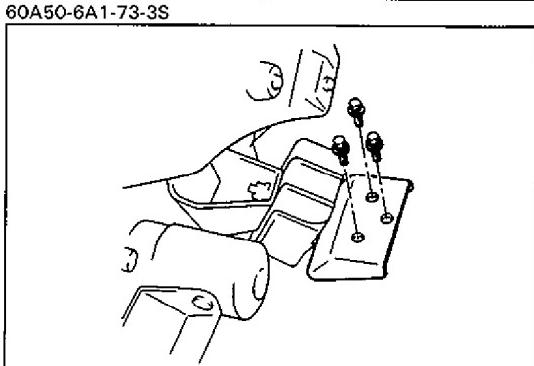
60A50-6A1-73-2S

21. Remove nuts fastening cylinder block and transmission.
22. Lower vehicle.
23. Support transmission with jack.
With A/T vehicle, don't jack under A/T oil pan to support transmission.



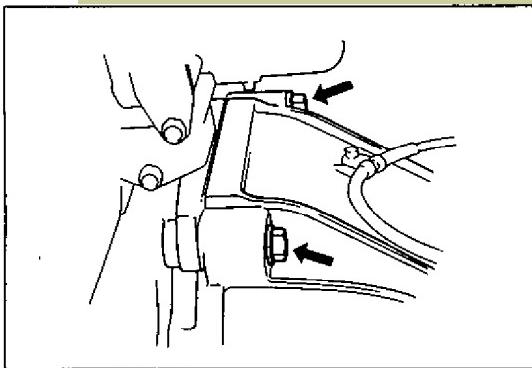
60A50-6A1-73-3S

24. Install lifting device.



60A50-6A1-73-5S

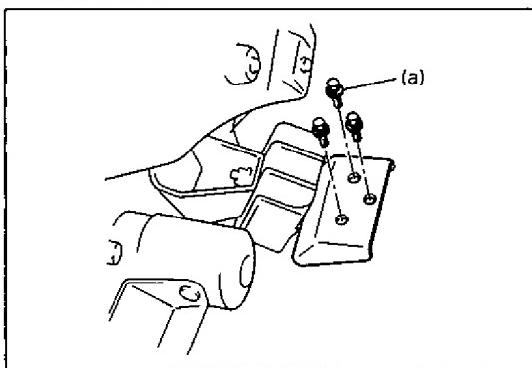
25. Remove engine mounting bracket bolts (R & L).
26. Before lifting engine, check to ensure all hoses, electric wires and cables are disconnected from engine.
27. Remove engine assembly from chassis and transmission by sliding towards the front side, and then carefully hoist engine assembly.



60A50-6A1-74-1S

INSTALLATION

1. Lower engine assembly into engine compartment and connect engine to transmission.
Hand-tighten bolts and nuts fastening cylinder block and transmission.

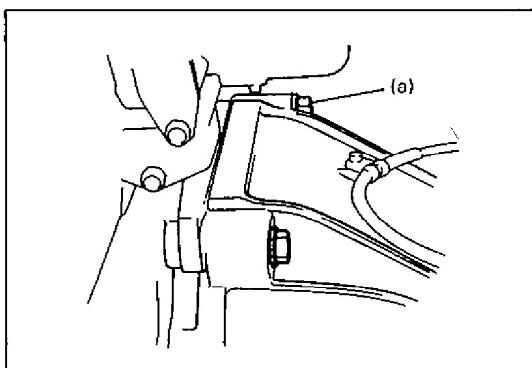


60A50-6A1-74-2S

2. Tighten engine mounting bracket bolts (R & L).

Tightening Torque

(a): 40–60 N·m (4.0–6.0 kg-m, 29.0–43.0 lb-ft)



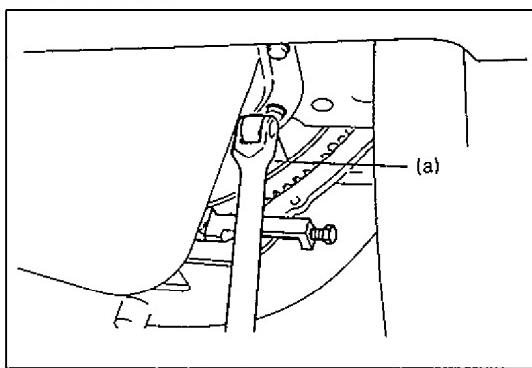
60A50-6A1-74-3S

3. Tighten bolts fastening cylinder block and transmission to specified torque.

Tightening Torque

(a): 70–100 N·m (7.0–10.0 kg-m, 51.0–72.0 lb-ft)

4. Remove lifting device.



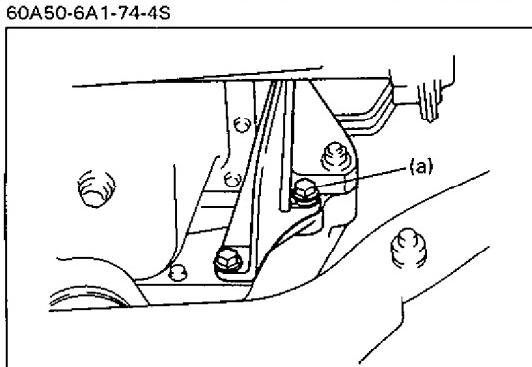
60A50-6A1-74-4S

5. Reverse removal procedure for installation, noting the following.

- Tighten torque converter bolts to specified torque.

Tightening Torque

(a): 60–70 N·m (6.0–7.0 kg-m, 43.5–50.5 lb-ft)

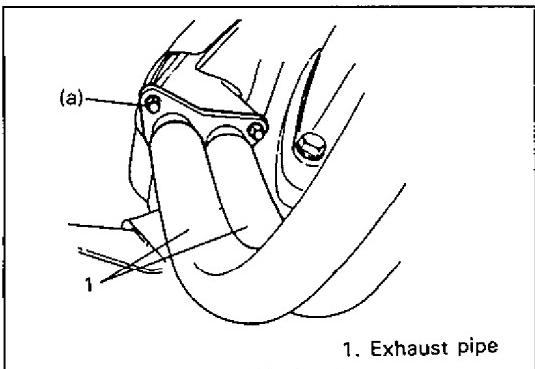


60A50-6A1-74-5S

- Tighten transmission stiffener bolts (left side) to specified torque.

Tightening Torque

(a): 40–60 N·m (4.0–6.0 kg-m, 29.0–43.0 lb-ft)

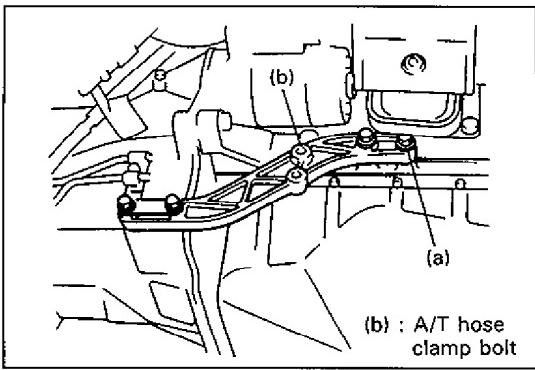


60A50-6A1-75-1S

- Tighten nuts and bolts of exhaust pipes to specified torque.

Tightening Torque

(a): 40—60 N·m (4.0—6.0 kg·m, 29.0—43.0 lb·ft)



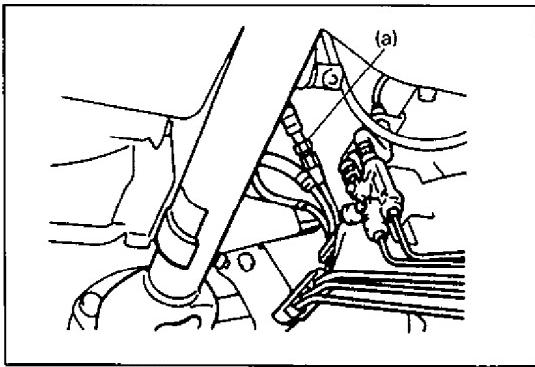
60A50-6A1-75-2S

- Tighten transmission stiffener bolts (right side) to specified torque.

Tightening Torque

(a): 40—60 N·m (4.0—6.0 kg·m, 29.0—43.0 lb·ft)

(b): 22—35 N·m (2.2—3.5 kg·m, 16.0—25.0 lb·ft)



60A50-6A1-75-3S

- Tighten flare nut of fuel feed pipe to specified torque. Be sure to use back-up wrench.

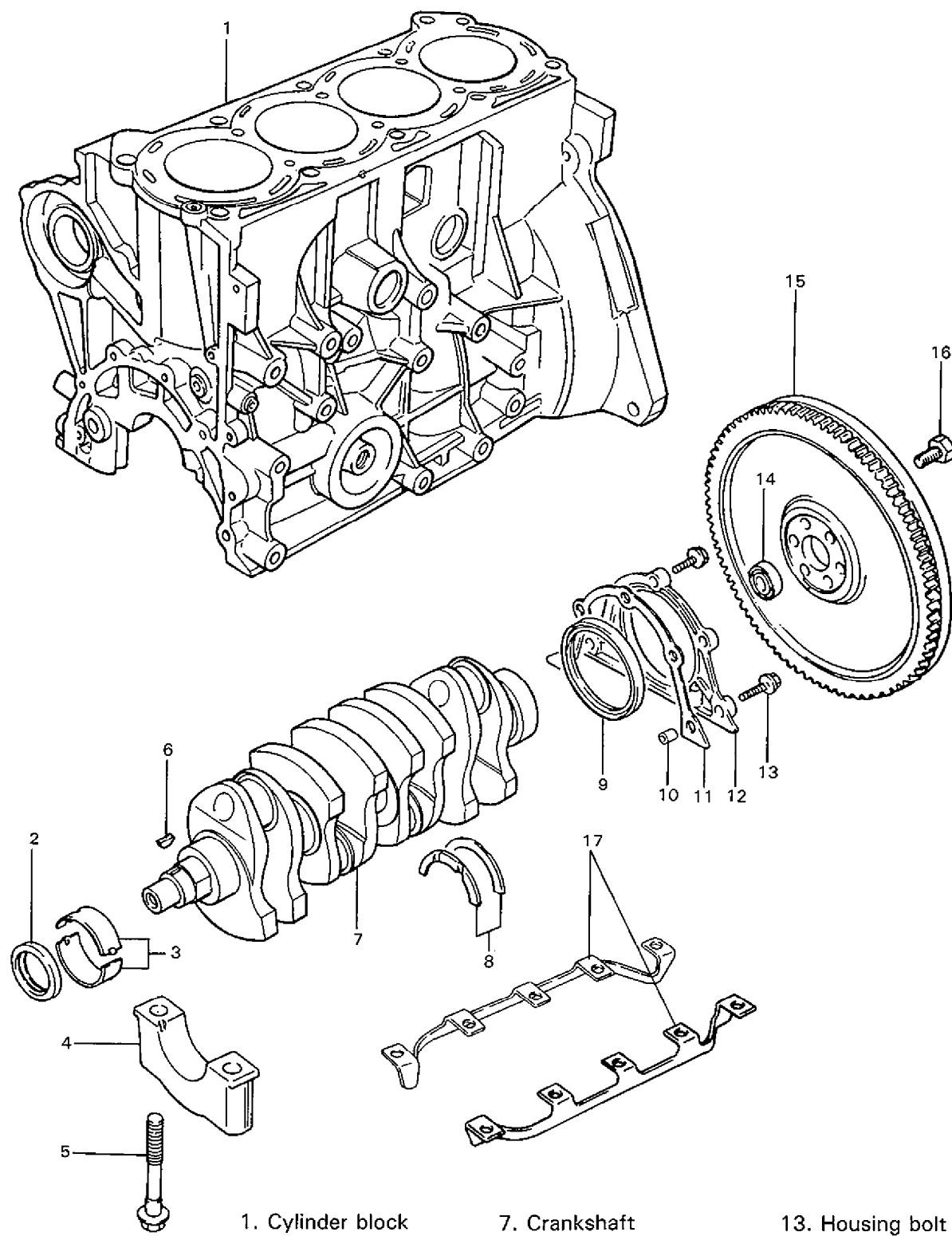
Tightening Torque

(a): 40—50 N·m (4.0—5.0 kg·m, 29.0—36.0 lb·ft)

6. Adjust water pump drive belt tension, referring to Section 6B.
7. Adjust power steering pump belt tension or A/C compressor belt tension, if equipped.
Refer to Section 0B.
8. Adjust accelerator cable play and A/T throttle cable play.
Refer to Section 6E1.
9. Check to ensure that all removed parts are back in place.
Reinstall any necessary parts which have not been reinstalled.
10. Refill engine with engine oil, referring to item "ENGINE OIL CHANGE" in Section 0B.
11. Refill cooling system referring to Section 6B.
12. Verify that there is no fuel leakage, water leakage and exhaust gas leakage at each connection.

60A50-6A1-75-4S

MAIN BEARINGS, CRANKSHAFT AND CYLINDER BLOCK



1. Cylinder block

2. Front oil seal

3. Main bearing

4. Bearing cap

5. Cap bolt

6. Timing pulley key

7. Crankshaft

8. Thrust bearing

9. Rear oil seal

10. Pin

11. Oil seal housing gasket

12. Oil seal housing

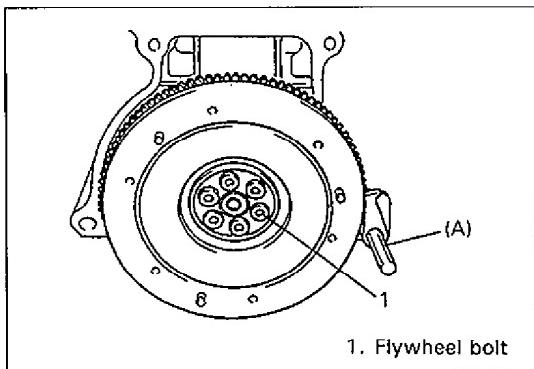
13. Housing bolt

14. Input shaft bearing

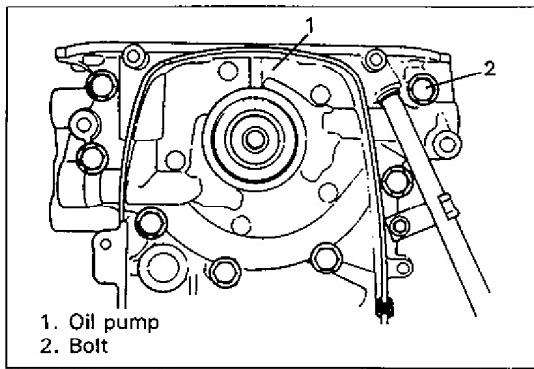
15. Flywheel

16. Flywheel bolt

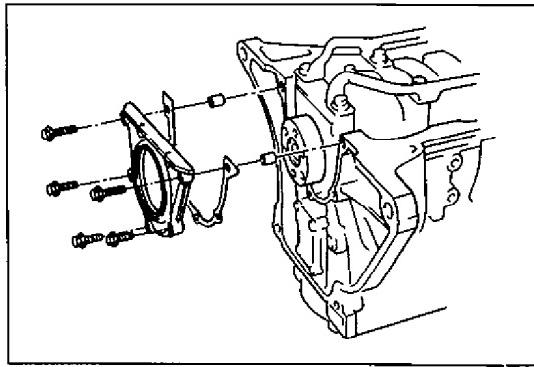
17. Bearing cap stiffener



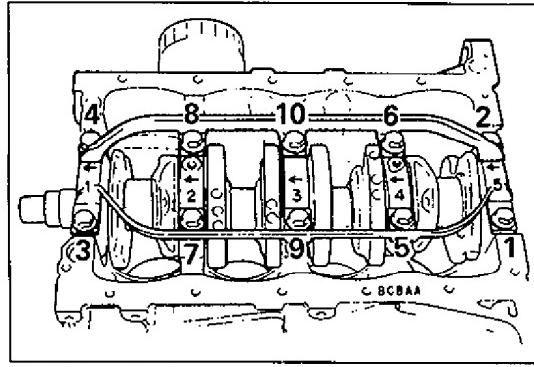
6A50-6A1-77-1S



6A50-6A1-77-2S



6A50-6A1-77-3S



6A50-6A1-77-4S

REMOVAL

1. Remove engine assembly from body as previously outlined.
2. Remove clutch cover, clutch disc and flywheel (drive plate for A/T).

Special Tool

(A): 09924-17810

3. Remove crankshaft pulley, timing belt and crankshaft timing pulley.

4. Remove cylinder head assembly.

5. Remove oil pan and oil pump strainer.

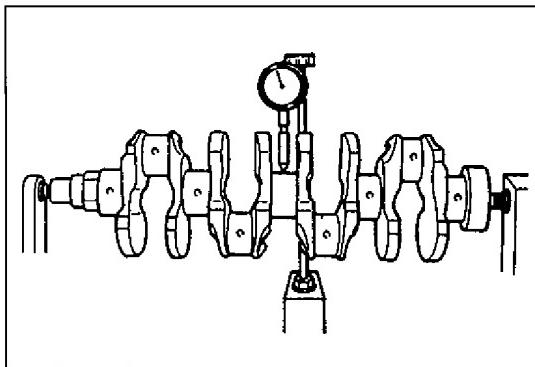
6. Remove oil pump.

7. Remove oil seal housing.

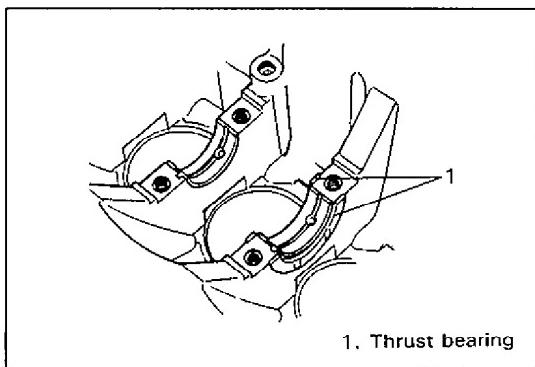
8. Remove connecting rod bearing caps.

9. Loosen crankshaft bearing cap bolts in such order as indicated in figure a little at a time and remove bearing caps.

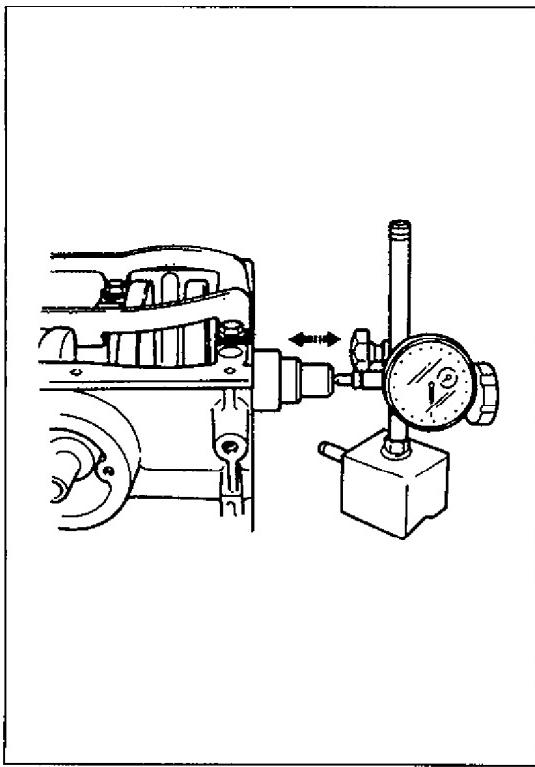
10. Remove crankshaft from cylinder block.



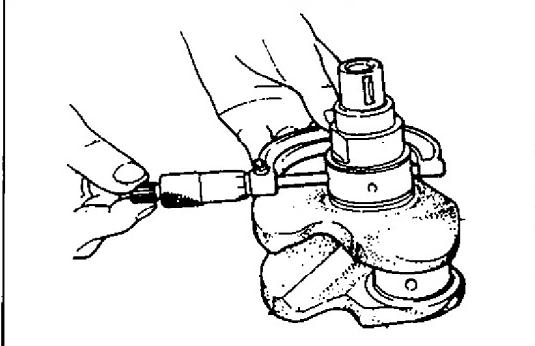
60A50-6A1-78-1S



60A50-6A1-78-2S



60A50-6A1-78-3S



60A50-6A1-78-5S

INSPECTION

Crankshaft

Crankshaft runout

Using a dial gauge, measure runout at center journal. Rotate crankshaft slowly. If runout exceeds its limit, replace crankshaft.

Limit on runout: 0.06 mm (0.0023 in.)

Crankshaft thrust play

Measure this play with crankshaft set in cylinder block in the normal manner, that is, with thrust bearing and journal bearing caps installed.

Use a dial gauge to read displacement in axial (thrust) direction of crankshaft.

If its limit is exceeded, replace thrust bearing with new standard one or oversize one to obtain standard thrust play.

Item	Standard	Limit
Crankshaft thrust play	0.11–0.31 mm (0.0044–0.0122 in.)	0.38 mm (0.0149 in.)

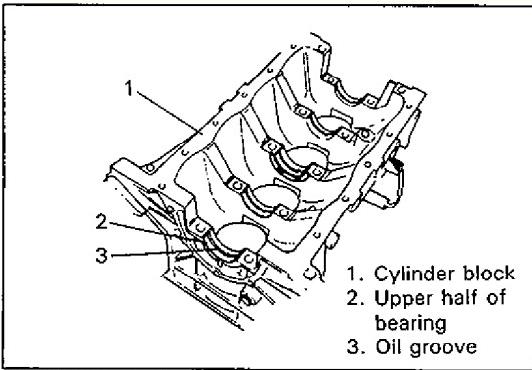
Thickness of crank-shaft thrust bearing	Standard	2.500 mm (0.0984 in.)
	Oversize:	0.125 mm (0.0049 in.)

Out-of-round and taper (uneven wear) of journals

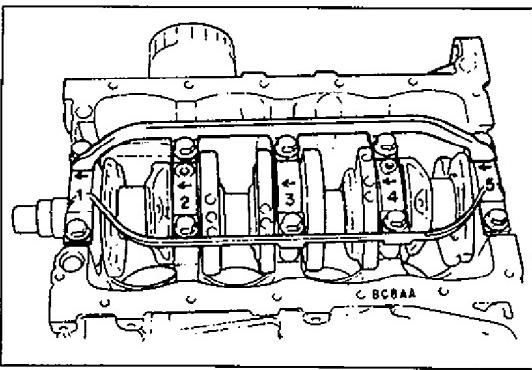
An unevenly worn crankshaft journal shows up as a difference in diameter at a cross section or along its length (or both). This difference, if any, is determined by taking micrometer readings.

If any one of journals is badly damaged or if amount of uneven wear in the sense explained above exceeds its limit, regrind or replace crankshaft.

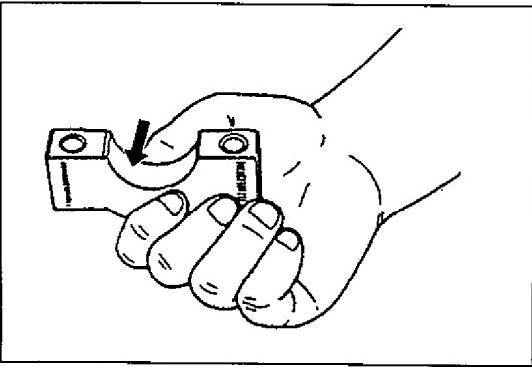
Limit on out-of-round and taper: 0.01 mm (0.0004 in.)



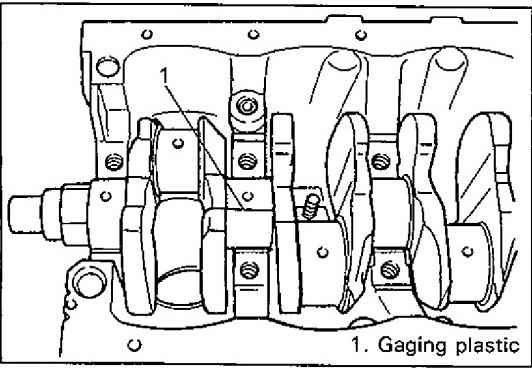
60A50-6A1-79-1S



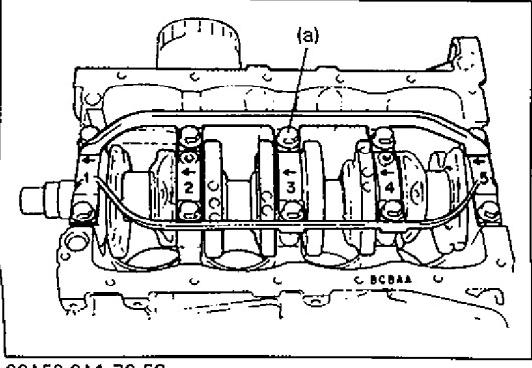
60A50-6A1-79-2S



60A50-6A1-79-3S



60A50-6A1-79-4S



Main Bearings

General information

- Service main bearings are available in standard size and 0.25 mm (0.0098 in.) undersize, and each of them has 5 kinds of bearings differing in tolerance.
- Upper half of bearing has oil groove as shown in figure. Install this half with oil groove to cylinder block.

- On each main bearing cap, arrow mark and number are embossed as shown in figure.

When installing each bearing cap to cylinder block, point arrow mark toward crankshaft pulley side and install each cap from that side to flywheel side in ascending order of numbers "1", "2", "3", "4" and "5". Tighten cap bolts to specified torque.

Inspection

Check bearings for pitting, scratches, wear or damage. If any malcondition is found, replace both upper and lower halves. Never replace one half without replacing the other half.

Main bearing clearance

Check clearance by using gaging plastic according to following procedure.

1. Remove bearing caps.
2. Clean bearings and main journals.
3. Place a piece of gaging plastic to full width of bearing (parallel to crankshaft) on journal, avoiding oil hole.

4. Install bearing cap as previously outlined and evenly torque cap bolts to specified torque.

Bearing cap MUST be torqued to specification in order to assure proper reading of clearance.

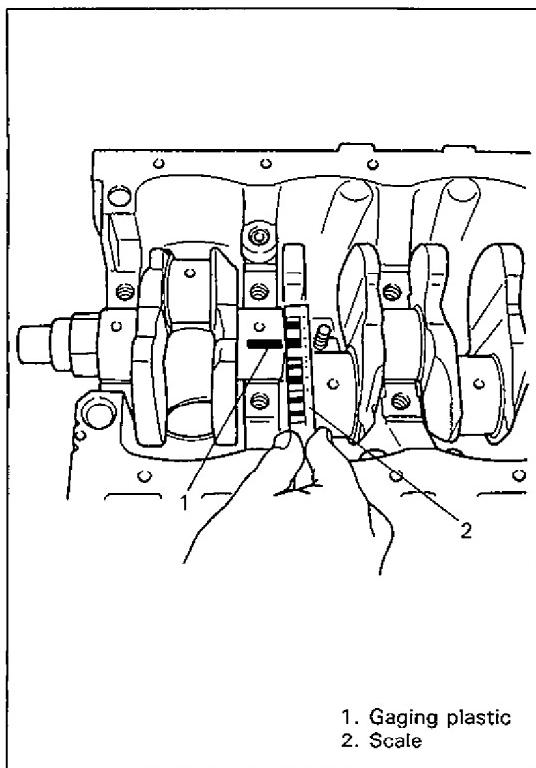
Tightening Torque

(a): 50–57 N·m (5.0–5.7 kg·m, 36.5–41.0 lb·ft)

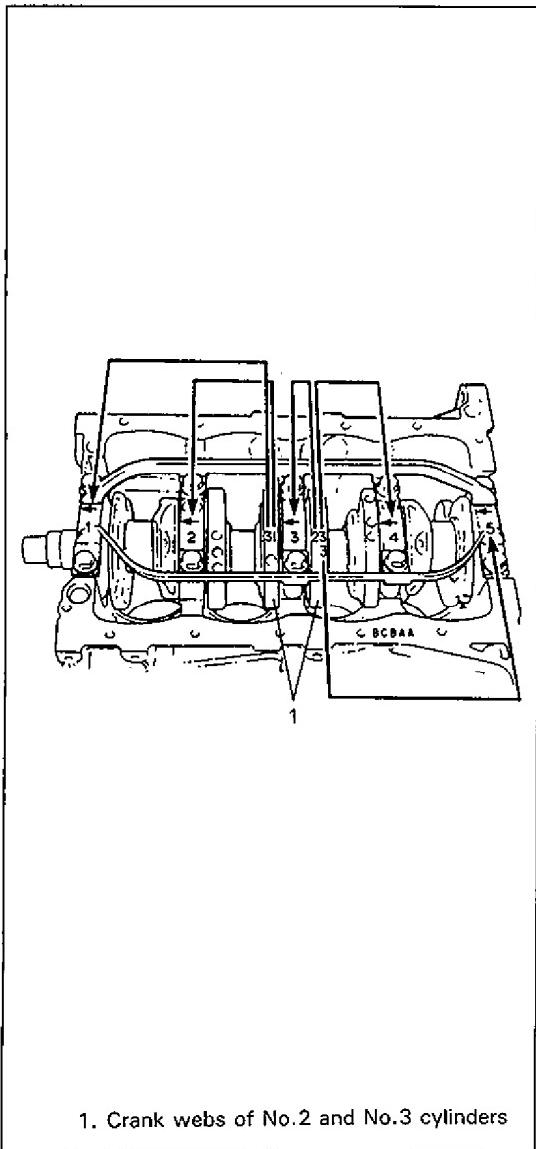
NOTE:

Do not rotate crankshaft while gaging plastic is installed.

60A50-6A1-79-5S



60A50-6A1-80-1S



60A50-6A1-80-3S

5. Remove cap and using scale on gaging plastic envelope, measure gaging plastic width at its widest point. If clearance exceeds its limit, replace bearing. Always replace both upper and lower inserts as a unit.

A new standard bearing may produce proper clearance. If not, it will be necessary to regrind crankshaft journal for use of 0.25 mm undersize bearing.

After selecting new bearing, recheck clearance.

Bearing clearance	Standard	Limit
	0.020–0.040 mm (0.0008–0.0016 in.)	0.060 mm (0.0023 in.)

Selection of main bearings

STANDARD BEARING:

If bearing is in malcondition, or bearing clearance is out of specification, select a new standard bearing according to following procedure and install it.

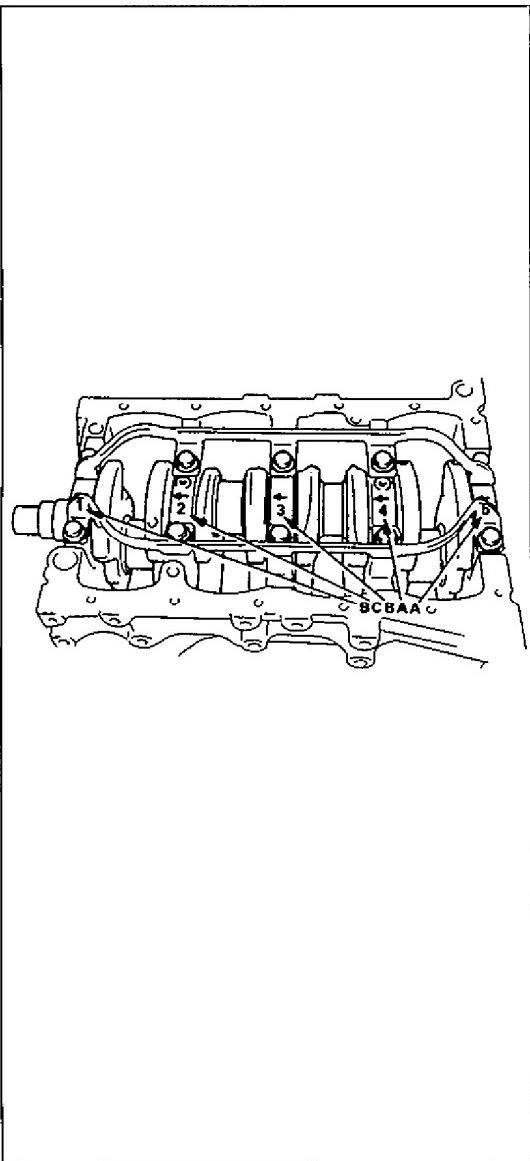
1. First check journal diameter by using following procedure. As shown in figure, crank webs of No.2 and No.3 cylinders have five stamped numerals.

Three kinds of numerals ("1", "2" and "3") represent following journal diameters.

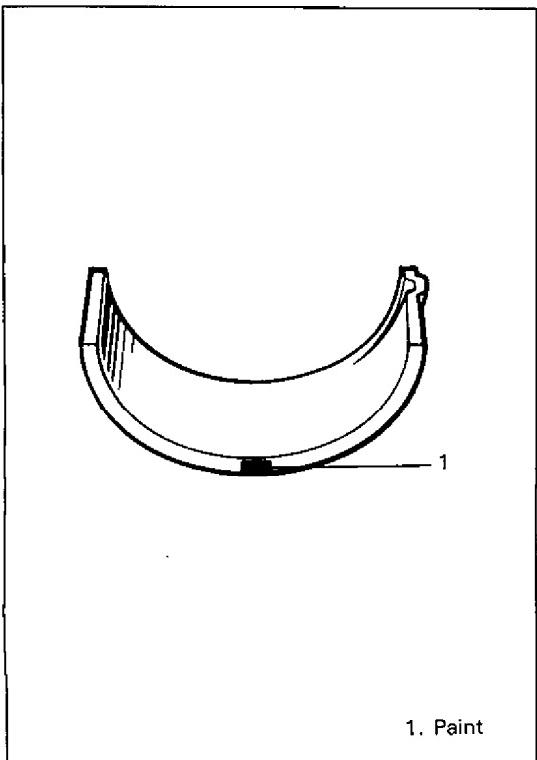
Numeral stamped	Journal diameter
1	51.994–52.000 mm (2.0470–2.0472 in.)
2	51.988–51.994 mm (2.0468–2.0470 in.)
3	51.982–51.988 mm (2.0465–2.0468 in.)

The first, second, third, fourth and fifth (left to right) stamped numerals represent journal diameters at bearing caps "1", "2", "3", "4" and "5" respectively.

For example, in figure, the first (leftmost) numeral "3" indicates that journal dia. at bearing cap "1" is within 51.982–51.988 mm, and second one "1" indicates that journal dia. at cap "2" is within 51.994–52.000 mm.



60A50-6A1-81-1S



1. Paint

2. Next, check bearing cap bore diameter without bearing. On mating surface of cylinder block, four alphabets are stamped as shown in figure. Three kinds of alphabets ("A", "B" and "C") represent following cap bore diameters.

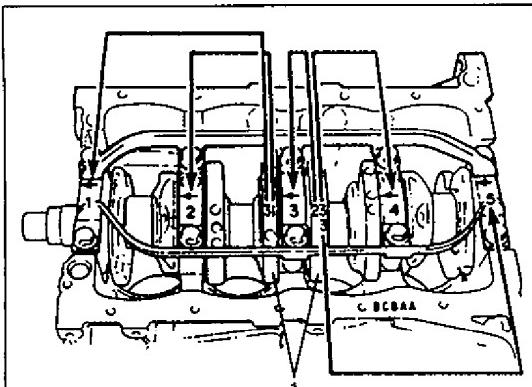
Alphabet stamped	Bearing cap bore diameter (without bearing)
A	56.000–56.006 mm (2.2047–2.2050 in.)
B	56.006–56.012 mm (2.2050–2.2052 in.)
C	56.012–56.018 mm (2.2052–2.2054 in.)

The first, second, third, fourth and fifth (left to right) stamped alphabets represent cap bore diameters of bearing caps "1", "2", "3", "4" and "5", respectively. For example, in figure, the first (leftmost) alphabet "B" indicates that cap bore dia. of bearing cap "1" is within 56.006–56.012 mm, and the fifth (rightmost) alphabet "A" indicates that cap bore dia. of cap "5" is within 56.000–56.006 mm.

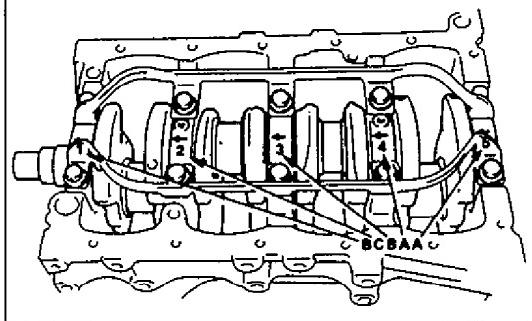
3. There are five kinds of standard bearings differing in thickness. To distinguish them, they are painted in following colors at the position as indicated in figure. Each color indicates following thickness at the center of bearing.

Color painted	Bearing thickness
Green	1.996–2.000 mm (0.0786–0.0787 in.)
Black	1.999–2.003 mm (0.0787–0.0788 in.)
Colorless (no paint)	2.002–2.006 mm (0.0788–0.0789 in.)
Yellow	2.005–2.009 mm (0.0789–0.0790 in.)
Blue	2.008–2.012 mm (0.0790–0.0791 in.)

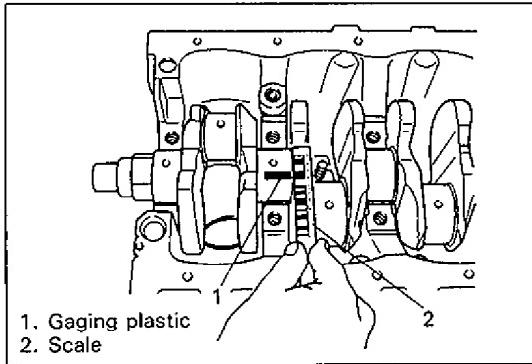
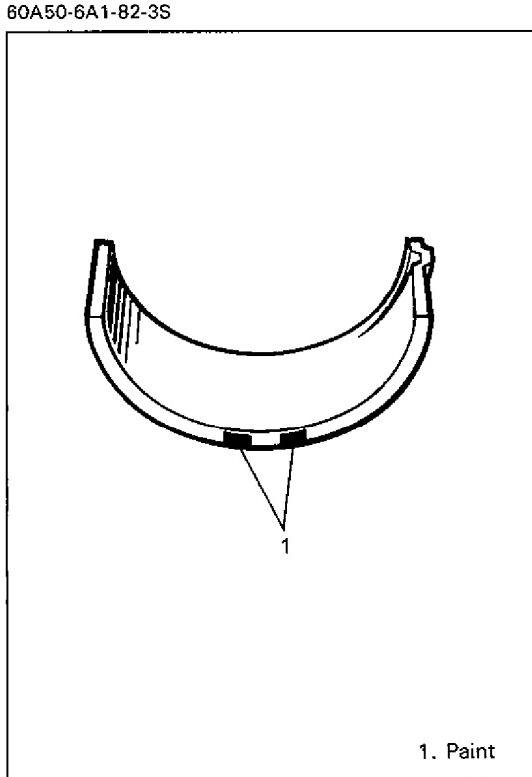
60A50-6A1-81-4S



1. Crank webs of No.2 and No.3 cylinders



60A50-6A1-82-1S

1. Gaging plastic
2. Scale
60A50-6A1-82-3S1. Paint
60A50-6A1-82-4S

4. From numerals stamped on crank webs of No.2 and No.3 cylinders and the alphabets stamped on mating surface of cylinder block, determine new standard bearing to be installed to journal, by referring to table given below.

For example, if numeral stamped on crank web is "1" and alphabet stamped on mating surface is "B", install a new standard bearing painted in "Black" to its journal.

	Numeral stamped on crank web (Journal diameter)			
	1	2	3	
Alphabet stamp- ed on mating surface (Bearing cap bore dia.)	A	Green	Black	Colorless
	B	Black	Colorless	Yellow
	C	Colorless	Yellow	Blue
New standard bearing to be installed.				

5. Using gaging plastic, check bearing clearance with newly selected standard bearing.

If clearance still exceeds its limit, use next thicker bearing and recheck clearance.

6. When replacing crankshaft or cylinder block due to any reason, select new standard bearings to be installed by referring to numerals stamped on new crankshaft or alphabets stamped on mating surface of new cylinder block.

UNDERSIZE BEARING (0.25 mm):

- 0.25 mm undersize bearing is available, in five kinds varying in thickness.

To distinguish them, each bearing is painted in following colors at such position as indicated in figure.

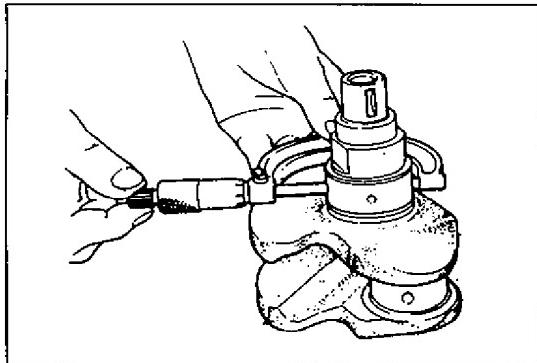
Each color represents following thicknesses at the center of bearing.

Color painted	Bearing thickness
Green & Red	2.121–2.125 mm (0.0835–0.0836 in.)
Black & Red	2.124–2.128 mm (0.0836–0.0837 in.)
Red only	2.127–2.131 mm (0.0837–0.0838 in.)
Yellow & Red	2.130–2.134 mm (0.0838–0.0839 in.)
Blue & Red	2.133–2.137 mm (0.0839–0.0840 in.)

- If necessary, regrade crankshaft journal and select undersize bearing to use with it as follows.
1. Regrade journal to following finished diameter.

**Finished diameter: 51.732—51.750 mm
(2.0367—2.0373 in.)**

60A50-6A1-83-1S

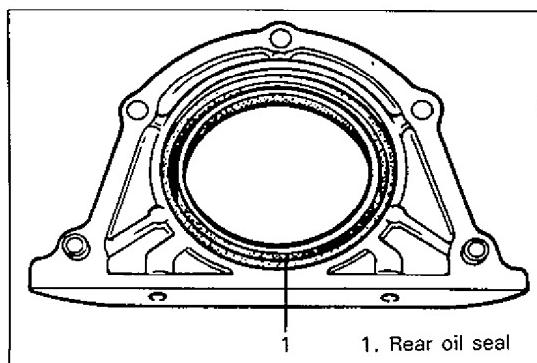


2. Using micrometer, measure reground journal diameter. Measurement should be taken in two directions perpendicular to each other in order to check for out-of-round.
3. Using journal diameter measured above and alphabets stamped on mating surface of cylinder block, select an undersize bearing by referring to table given below. Check bearing clearance with newly selected undersize bearing.

60A50-6A1-83-2S

		Measured journal diameter		
		51.744—51.750 mm (2.0371—2.0373 in.)	51.738—51.744 mm (2.0369—2.0371 in.)	51.732—51.738 mm (2.0367—2.0369 in.)
Alphabets stamped on mating surface of cylinder block	A	Green & Red	Black & Red	Red only
	B	Black & Red	Red only	Yellow & Red
	C	Red only	Yellow & Red	Blue & Red
Undersize bearing to be installed				

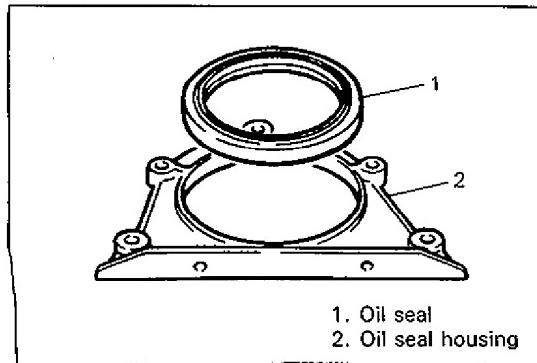
60A50-6A1-83-3S



Rear Oil Seal

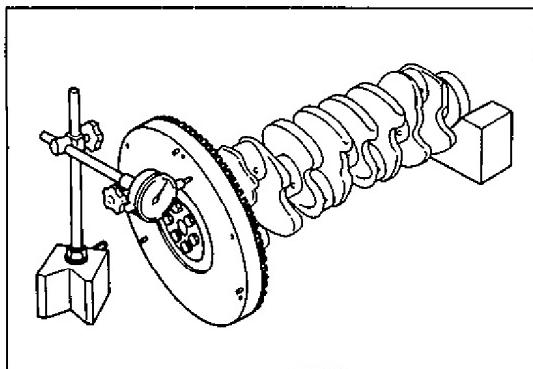
Carefully inspect oil seal for wear or damage. If its lip is worn or damaged, replace it.

60A50-6A1-83-4S



For oil seal installation, press-fit rear oil seal so that oil seal housing end face is flush with oil seal end face.

60A50-6A1-83-5S

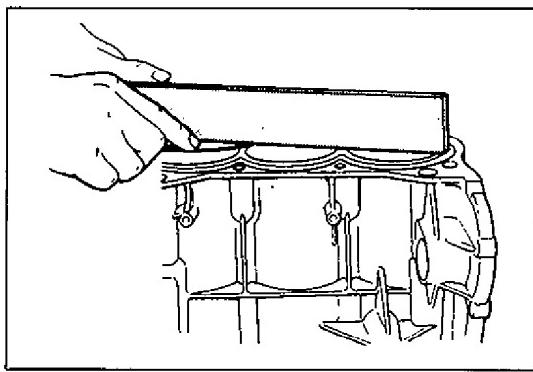


60A50-6A1-84-1S

Flywheel

- If ring gear is damaged, cracked or worn, replace flywheel.
- If the surface contacting clutch disc is damaged, or excessively worn, replace flywheel.
- Check flywheel for face runout with dial gauge.
If runout exceeds its limit, replace flywheel.

Limit on runout: 0.2 mm (0.0078 in.)

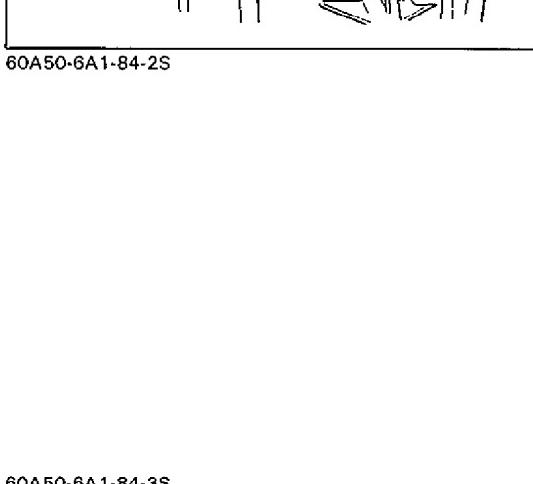


60A50-6A1-84-2S

Cylinder Block**Distortion of gasketed surface**

Using straightedge and thickness gauge, check gasketed surface for distortion and, if flatness exceeds its limit, correct it.

Item	Standard	Limit
Flatness	0.03 mm (0.0012 in.)	0.06 mm (0.0024 in.)



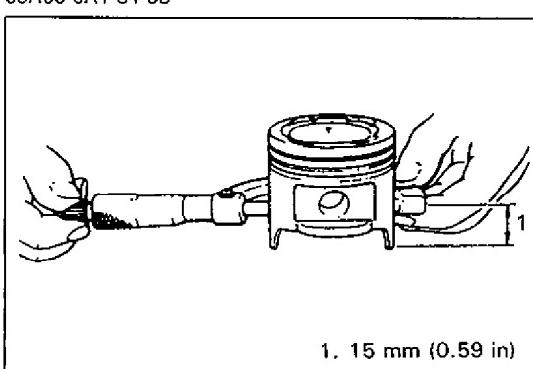
60A50-6A1-84-3S

Honing or reboring cylinders

1. When any cylinder needs reboring, all other cylinders must also be rebored at the same time.
2. Select oversized piston according to amount of cylinder wear.

Size	Piston diameter
O/S 0.25	75.220–75.230 mm (2.9614–2.9618 in.)
O/S 0.50	75.470–75.480 mm (2.9712–2.9716 in.)

3. Using micrometer, measure piston diameter.



60A50-6A1-84-4S

4. Calculate cylinder bore diameter to be rebored.

$$D = A + B - C$$

D: Cylinder bore diameter to be rebored.

A: Piston diameter as measured.

B: Piston clearance = 0.02–0.04 mm
(0.0008–0.0015 in.)

C: Allowance for honing = 0.02 mm (0.0008 in.)

5. Rebore and hone cylinder to calculated dimension.

NOTE:

Before reboring, install all main bearing caps in place and tighten to specification to avoid distortion of bearing bores.

6. Measure piston clearance after honing.

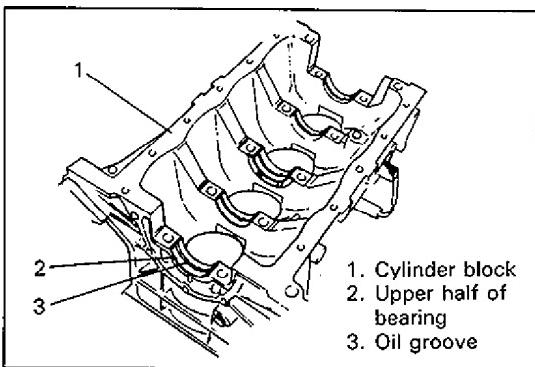
60A50-6A1-85-1S

INSTALLATION

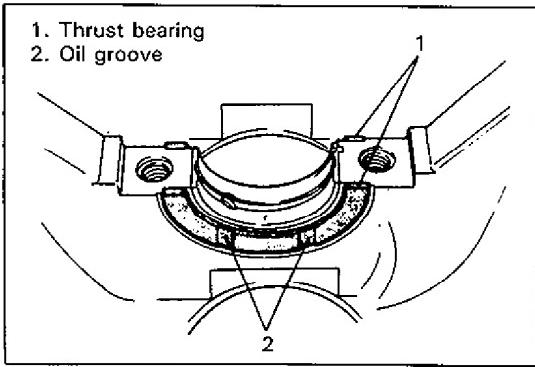
NOTE:

- All parts to be installed must be perfectly clean.
- Be sure to oil crankshaft journals, journal bearings, thrust bearings, crankpins, connecting rod bearings, pistons, piston rings and cylinder bores.
- Journal bearings, bearing caps, connecting rods, rod bearings, rod bearing caps, pistons and piston rings are in combination sets. Do not disturb such combination and make sure that each part goes back to where it came from, when installing.

60A50-6A1-85-2S



60A50-6A1-85-4S



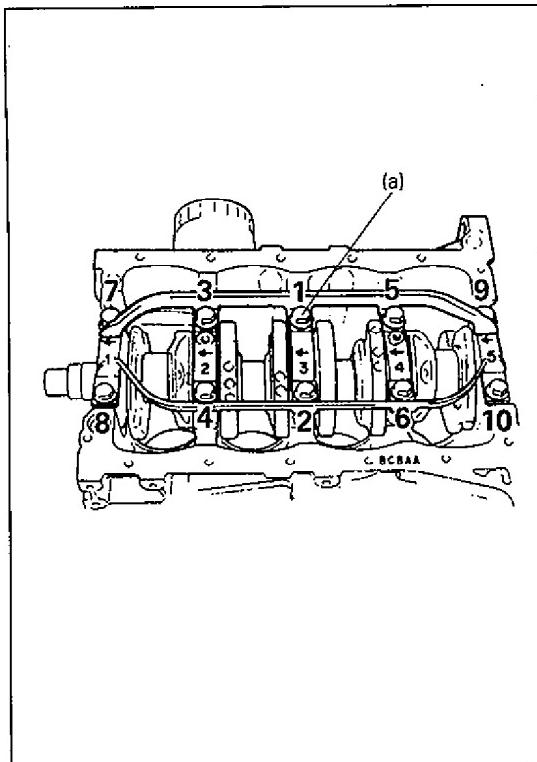
1. Install main bearings to cylinder block.

One of two halves of main bearing, has an oil groove. Install it to cylinder block, and the other half without oil groove to bearing cap.

Make sure that two halves are painted in the same color.

2. Install thrust bearings to cylinder block between No.2 and No.3 cylinders. Face oil groove sides to crank webs.

60A50-6A1-85-5S



60A50-6A1-86-1S

3. Install crankshaft to cylinder block.
4. Install bearing cap to cylinder block, making sure to point arrow mark (on each cap) to crankshaft pulley side. Fit them sequentially in ascending order, 1, 2, 3, 4 and 5, starting from pulley side.

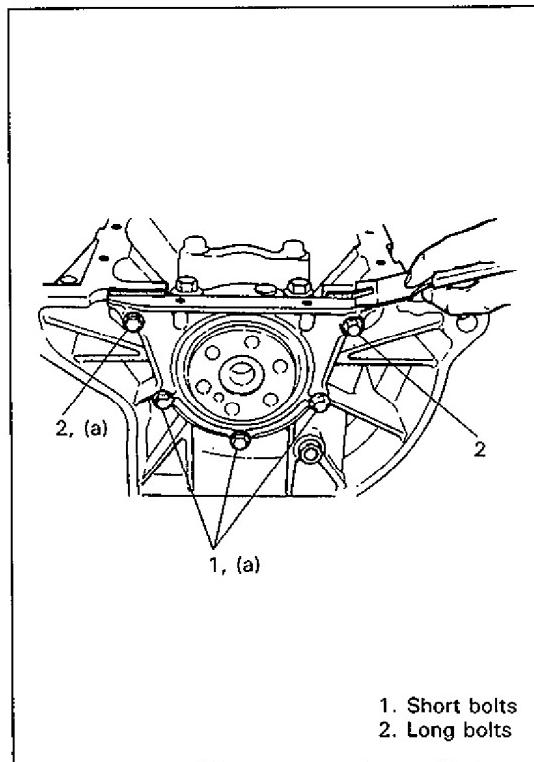
After installing bearing cap stiffeners, tighten bearing cap bolts in such order as shown in figure a little at a time and repeat it till they are tightened to specified torque.

Tightening Torque

(a): 50—57 N·m (5.0—5.7 kg·m, 36.5—41.0 lb·ft)

NOTE:

After tightening cap bolts, check to be sure that crankshaft rotates smoothly when turning it by 8.0 N·m (0.8 kg·m, 5.8 lb·ft) torque or below.



60A50-6A1-86-3S

5. Install new gasket and oil seal housing.

Do not reuse gasket removed in disassembly. Apply engine oil to oil seal lip before installation. Tighten housing bolts to specification.

Tightening Torque

(a): 9—12 N·m (0.9—1.2 kg·m, 7.0—8.5 lb·ft)

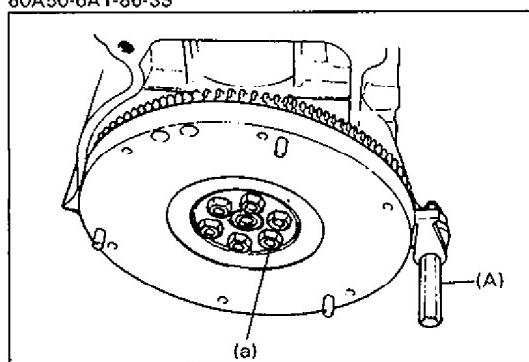
NOTE:

As there are 2 types of housing bolts, refer to figure for their correct use.

After installing oil seal housing, gasket edges might bulge out; if so, cut them off to make them flush with cylinder block and oil seal housing.

6. Install oil pump.

Refer to item "Oil pump" for installation of oil pump.



60A50-6A1-86-5S

7. Install flywheel (M/T model) or drive plate (A/T model). Using special tool, lock flywheel or drive plate, and torque its bolts to specification.

Special Tool

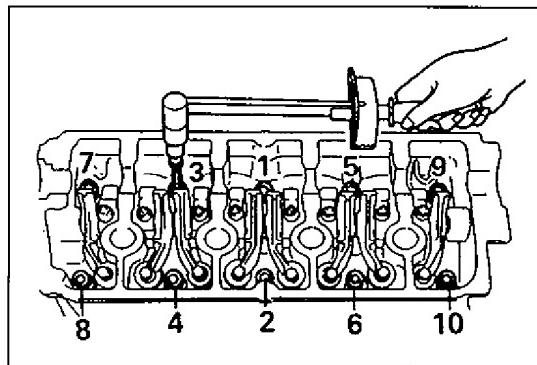
(A): 09924-17810

Tightening Torque

(a): 75—80 N·m (7.5—8.0 kg·m, 54.5—57.5 lb·ft)

8. Install pistons and connecting rods as previously outlined.
9. Install oil pump strainer and oil pan as previously outlined.

60A59-6A1-87-1S



60A50-6A1-87-2S

10. Install cylinder head assembly to cylinder block as previously outlined.

NOTE:

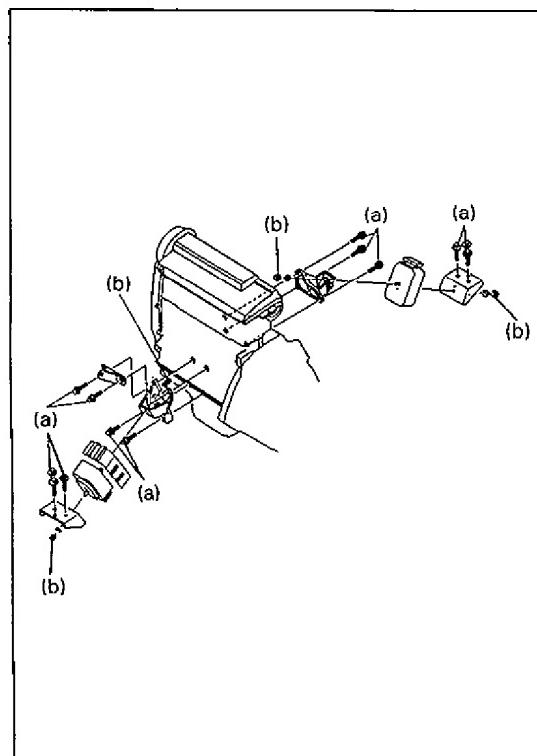
Tighten cylinder head bolts to specified torque as previously outlined. Whenever installing cylinder head to new cylinder block, use following procedure to tighten cylinder head bolts.

- Tighten cylinder head bolts to specified torque as previously outlined and loosen them once till tightening torque becomes "zero". And then torque them to specification again.

11. Install camshaft, crankshaft timing belt pulley, timing belt, crankshaft pulley, water pump pulley, etc., as previously outlined.

12. Install clutch to flywheel (for M/T vehicle). For clutch installation, refer to "CLUTCH" section.

60A50-6A1-87-3S



13. Install engine mountings and brackets.

Tightening Torque

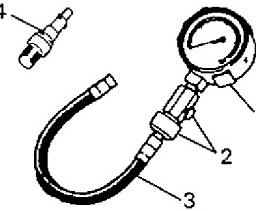
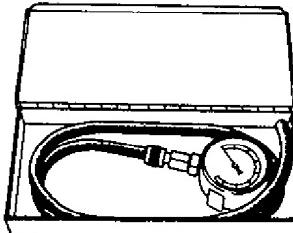
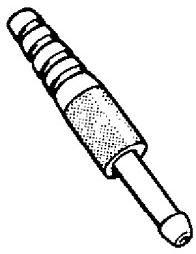
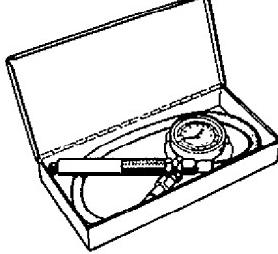
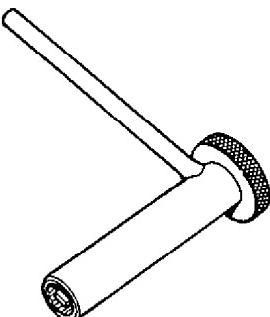
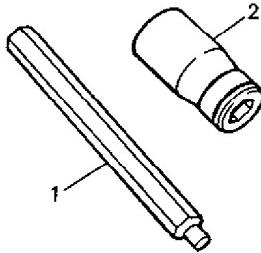
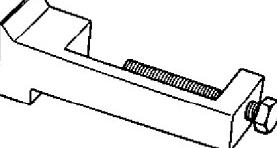
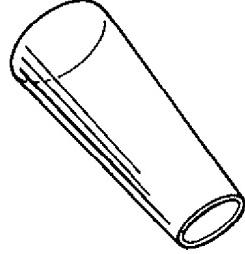
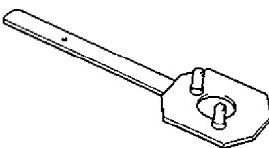
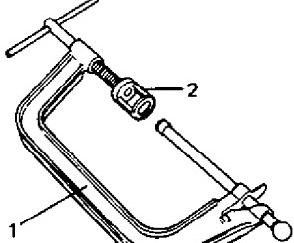
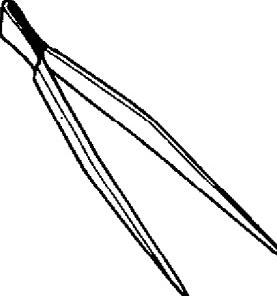
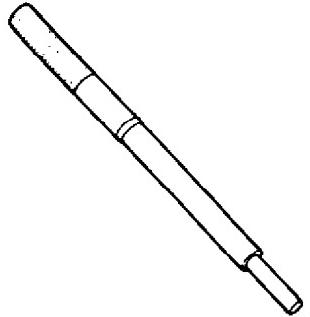
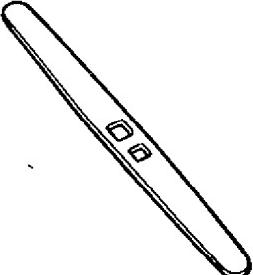
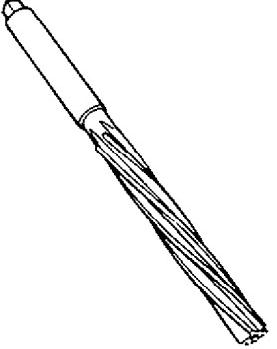
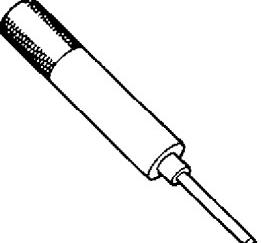
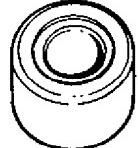
(a): 40–60 N·m (4.0–6.0 kg·m, 29.0–43.0 lb·ft)

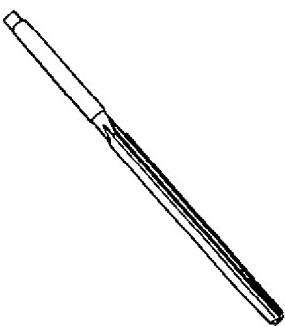
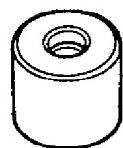
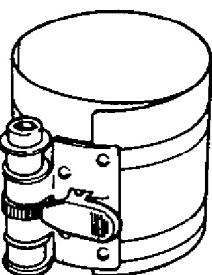
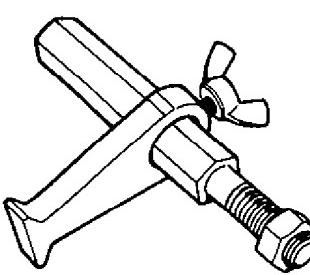
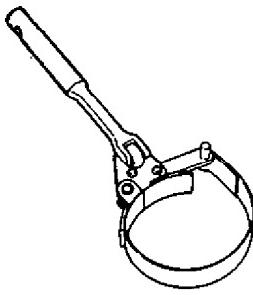
(b): 40–50 N·m (4.0–5.0 kg·m, 29.0–36.0 lb·ft)

14. Install engine assembly to vehicle as previously outlined.

60A50-6A1-87-4S

SPECIAL TOOLS

 <p>1. 09915-64510-001 Compression gauge 2. 09915-64510-002 Connector 3. 09915-64530 Hose 4. 09915-67010 Attachment</p>	 <p>09915-67310 Vacuum gauge</p>	 <p>09918-08210 Vacuum gauge hose joint</p>	 <p>09915-77310 Oil pressure gauge</p>
 <p>09917-18210 Tappet adjuster wrench</p>	 <p>1. 09900-00415 8 mm hexagon wrench bit 2. 09900-00411 Hexagon wrench socket</p>	 <p>09927-56010 Gear stopper</p>	 <p>09926-18210 Oil seal guide (Vinyl resin)</p>
 <p>09917-68220 Camshaft pulley holder</p>	 <p>1. 09916-14510 Valve lifter 2. 09916-14910 Valve lifter attachment</p>	 <p>09916-84510 Forceps</p>	 <p>09916-44910 Valve guide remover</p>
 <p>09916-34541 Reamer handle</p>	 <p>09916-38210 Reamer (11 mm)</p>	 <p>09916-58210 Valve guide installer handle</p>	 <p>09916-56011 Valve guide installer attachment</p>

			
09916-34550 Reamer (5.5 mm)	09917-98221 Valve stem seal installer	09916-77310 Piston ring compressor	09924-17810 Flywheel holder
			
09915-47310 Oil filter wrench			

60A50-6A1-89-1S

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Sealant	SUZUKI BOND NO.1207C (99000-31150)	<ul style="list-style-type: none"> Mating surfaces of cylinder block and oil pan.
Sealant	SUZUKI BOND NO.1215 (99000-31110)	<ul style="list-style-type: none"> Mating surfaces of camshaft housings (No.6). Mating surfaces of distributor case and cylinder block.

60A50-6A1-89-2S

RECOMMENDED TORQUE SPECIFICATIONS

FASTENING PARTS	TIGHTENING TORQUE		
	N·m	kg·m	lb·ft
Oil pressure switch	12–15	1.2–1.5	9.0–10.5
Valve adjusting screw lock nuts	10–13	1.0–1.3	7.5–9.0
Cylinder head cover bolts	9–12	0.9–1.2	7.0–8.5
Intake manifold bolts and nuts	18–28	1.8–2.8	13.5–20.0
Intake manifold stiffener bolts	40–60	4.0–6.0	29.0–43.0
Fuel feed pipe flare nut	40–50	4.0–5.0	29.0–36.0
Timing belt tensioner stud	9–12	0.9–1.2	7.0–8.5
Timing belt tensioner bolt	22–28	2.2–2.8	16.0–20.0
Timing belt cover bolts and nut	9–12	0.9–1.2	7.0–8.5
Exhaust manifold bolts and nuts	18–28	1.8–2.8	13.5–20.0
Crankshaft pulley bolt	14–18	1.4–1.8	10.5–13.0
Exhaust pipe nuts and bolts	40–60	4.0–6.0	29.0–43.0
Exhaust manifold stiffener nut			
Oil pump strainer bolt and stay bolt	9–12	0.9–1.2	7.0–8.5
Oil pan bolts and nuts			
Oil pan drain plug	30–40	3.0–4.0	22.0–28.5
Transmission stiffener bolts	40–60	4.0–6.0	29.0–43.0
Oil pump rotor plate screws	9–12	0.9–1.2	7.0–8.5
Oil pump case bolts			
Crankshaft timing belt pulley bolt	125–135	12.5–13.5	90.5–97.5
Camshaft housing bolts	9–12	0.9–1.2	7.0–8.5
Rocker arm shaft bolts			
Rocker arm shaft plug	30–35	3.0–3.5	22.0–25.0
Camshaft timing belt pulley bolt	56–64	5.6–6.4	41.0–46.0
Cylinder head venturi plug	4–6	0.4–0.6	3.0–4.0
Cylinder head bolts	65–70	6.5–7.0	47.5–50.5
Connecting rod bearing cap nuts	33–37	3.3–3.7	24.0–26.5
Bolt and nuts fastening T/M and cylinder block	70–100	7.0–10.0	51.0–72.0
Torque converter bolts (A/T)	60–70	6.0–7.0	43.5–50.5
Crankshaft main bearing cap bolts	50–57	5.0–5.7	36.5–41.0
Flywheel bolts (Drive plate bolts for A/T)	75–80	7.5–8.0	54.5–57.5
Engine mounting & bracket bolts and nuts	Refer to p. 6A1-87.		

SECTION 6B

ENGINE COOLING

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60A50-6B-1-1S

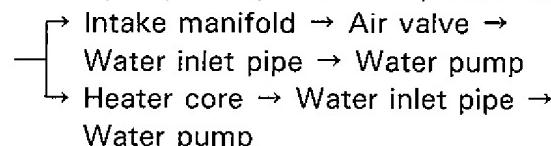
GENERAL DESCRIPTION

The cooling system consists of the radiator cap, radiator, water reservoir tank, hoses, water pump, cooling fan & clutch, thermostat. The radiator is of tube-and-fin type.

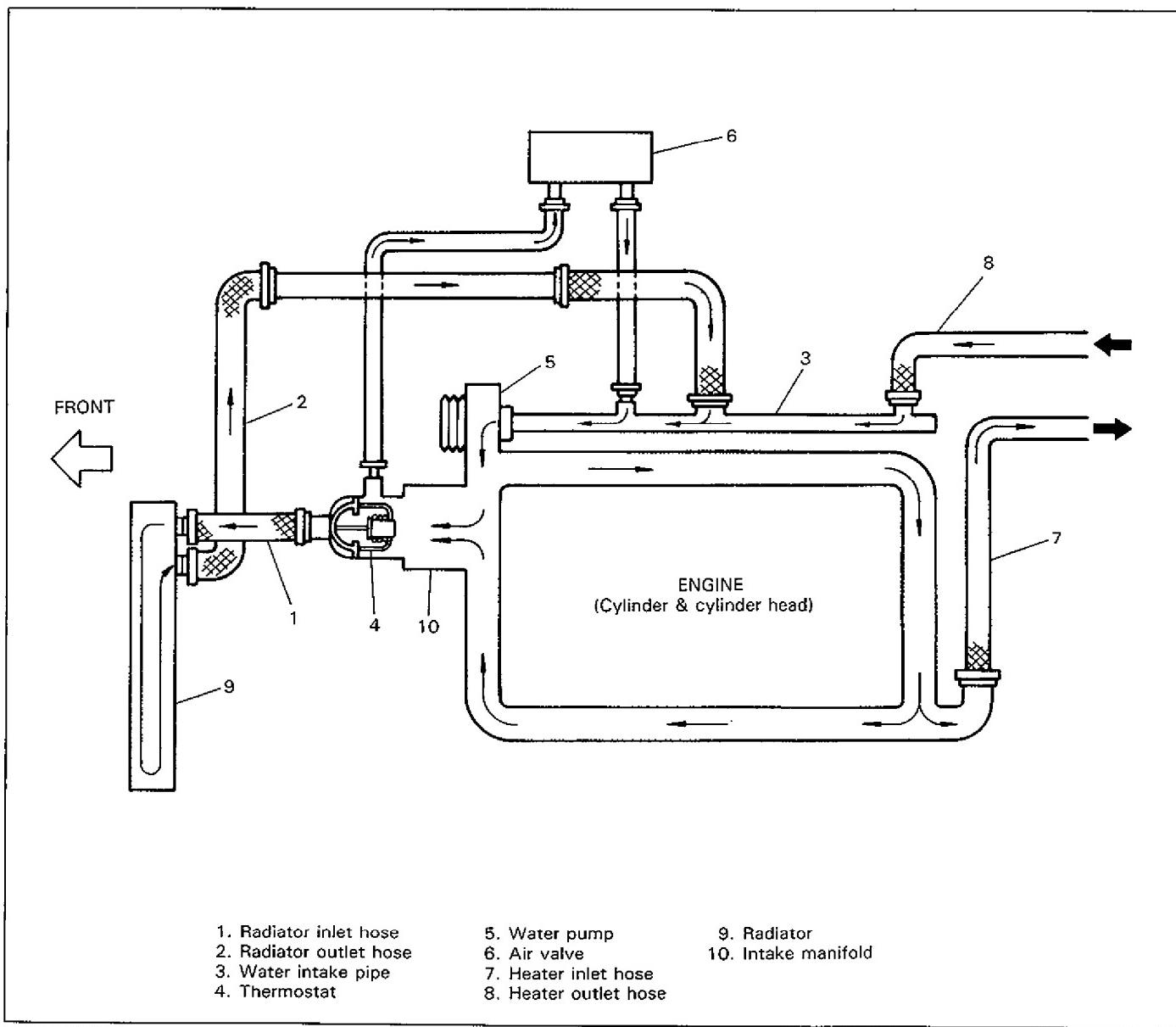
COOLING SYSTEM CIRCULATION

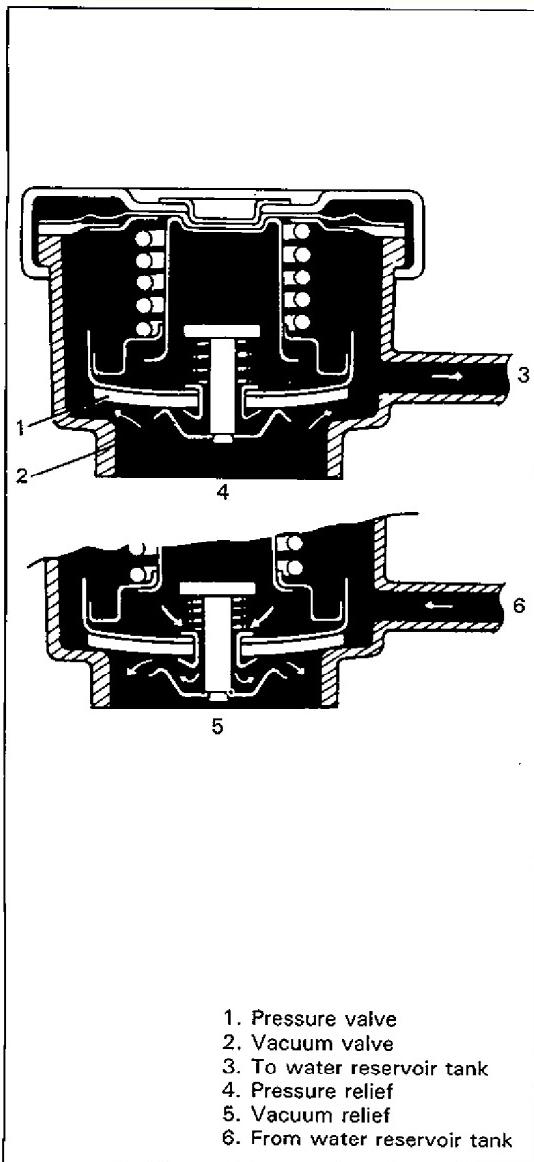
1. While the engine is warmed up (thermostat closed), Cooling water circulates as follows.

Water pump → Cylinder → Cylinder head →



2. When cooling water is warmed up to normal temperature and the thermostat opens, cooling water passes through the radiator core to be cooled as well as the above flow circuit.





60A50-6B-3-1S

1. Pressure valve
2. Vacuum valve
3. To water reservoir tank
4. Pressure relief
5. Vacuum relief
6. From water reservoir tank

RADIATOR CAP

A pressure-vent cap is used on the radiator. The cap contains a pressure valve and vacuum valve. The pressure valve is held against its seat by a spring of pre-determined strength which protects the cooling system by relieving the pressure if the pressure in cooling system rises by 0.9 kg/cm^2 (12.8 psi, 90 kPa). The vacuum valve is held against its seat by a light spring which permits opening of the valve to relieve vacuum created in the system when it cools off and which otherwise might cause the radiator to collapse.

The cap has its face marked 0.9, which means that its pressure valve opens at 0.9 kg/cm^2 (12.8 psi, 90 kPa).

NOTE:

Do not remove radiator cap to check engine coolant level; check coolant visually through see-through water reservoir tank.

Coolant should be added only to reservoir tank as necessary.

WARNING:

As long as there is pressure in the cooling system, the temperature can be considerably higher than the boiling temperature of the solution in the radiator without causing the solution to boil. Removal of the radiator cap while engine is hot and pressure is high will cause the solution to boil instantaneously and possibly with explosive force, spewing the solution over engine, vehicle body and person removing cap. If the solution contains flammable anti-freeze such as alcohol (not recommended for use at any time), there is also the possibility of causing a serious fire.

WATER RESERVOIR TANK

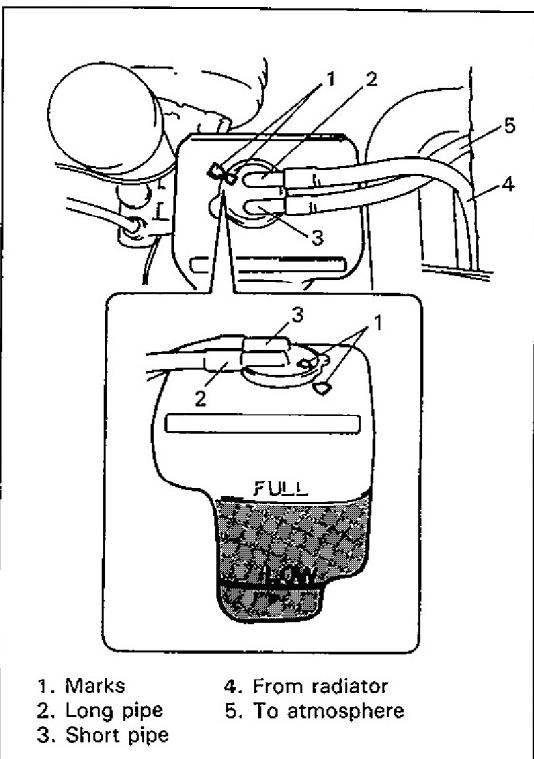
A "see-through" plastic reservoir tank is connected to the radiator by a hose. As the vehicle is driven, the coolant is heated and expands. The portion of the coolant displaced by this expansion flows from the radiator into the reservoir tank. When the vehicle is stopped and the coolant cools and contracts, the displaced coolant is drawn back into the radiator by vacuum.

Thus, the radiator is kept filled with coolant to the desired level at all times, resulting in increased cooling efficiency. Coolant level should be between "FULL" and "LOW" marks on the reservoir tank.

Coolant should be added only to the reservoir tank as necessary.

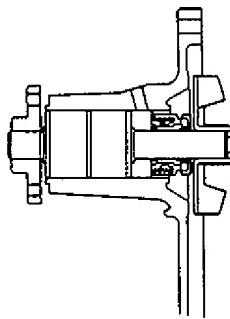
NOTE:

When installing reservoir tank cap, align arrow marks on the tank and cap.



60A50-6A-3-4S

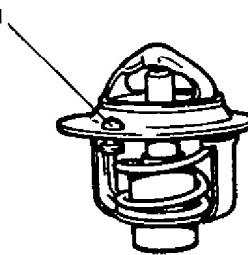
1. Marks
2. Long pipe
3. Short pipe
4. From radiator
5. To atmosphere



60A50-6B-4-1S

WATER PUMP

The centrifugal type water pump is used in the cooling system. The pump impeller is supported by a totally sealed bearing. The water pump can not be disassembled.



1. Air bleed valve

60A50-6B-4-2S

THERMOSTAT

A wax pellet type thermostat is used in the coolant outlet passage to control the flow of engine coolant, to provide fast engine warm up and to regulate coolant temperatures.

A wax pellet element is hermetically contained in a metal case, and expands when heated and contracts when cooled.

When the pellet is heated and expands, the metal case pushes down the valve to open it.

As the pellet is cooled, the contraction allows the spring to close the valve.

Thus, the valve remains closed while the coolant is cold, preventing circulation of coolant through the radiator.

At this point, coolant is allowed to circulate only throughout the engine to warm it quickly and evenly.

As the engine warms, the pellet expands and the thermostat valve opens, permitting coolant to flow through the radiator. In the top portion of the thermostat, an air bleed valve is provided; this valve is for venting out the gas or air, if any, that is accumulated in the circuit.

There are two types of thermostat, A and B, as given below. Either one is used depending on vehicle specifications. The temperature at which the valve begins to open is stamped on each thermostat. Be sure to note this stamped temperature for replacement.

Thermostat functional spec. $\pm 2.0^{\circ}\text{C}$ (3.6°F)		
	Thermostat "A"	Thermostat "B"
Temp. at which valve begins to open	82°C (179°F)	88°C (190°F)
Temp. at which valve becomes fully open	95°C (203°F)	100°C (212°F)
Valve lift	More than 8 mm at 95°C (203°F)	More than 8 mm at 100°C (212°F)

COOLING FAN CLUTCH

Fluid is enclosed in the cooling fan clutch and at its center front, there is a bimetal whose thermal reaction and the engine speed control the cooling fan speed.

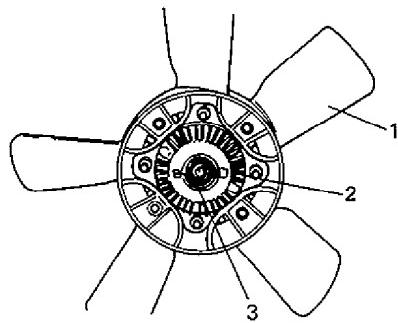
The clutch is installed to the water pump shaft, so that the cooling fan operates at approximately the same speed as the water pump shaft regardless of the air temperature at the front of the clutch when the water pump shaft turns at low speed (when the engine running at idle speed).

When the air temperature at the front of the clutch exceeds 55°C (131°F) and the engine speed increases gradually, the clutch slippage increases. Thus even when revolution speed of the water pump shaft increases that of the cooling fan does not as much.

When the engine speed increases further at over 55°C (131°F) air temperature and revolution speed of the water pump shaft exceeds 4,000 r/min (rpm), that of the cooling fan becomes almost constant (2,800 to 3,100 r/min) independently of the water pump shaft.

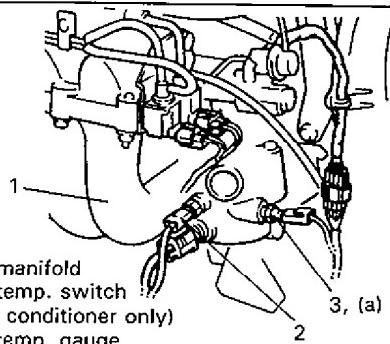
NOTE:

Do not disassemble clutch assembly.



1. Cooling fan
2. Fan clutch
3. Bimetal

60A50-6B-5-1S



1. Intake manifold
2. Water temp. switch
(For air conditioner only)
3. Water temp. gauge

60A50-6B-5-4S

WATER TEMP. GAUGE

A water temp. gauge is located at intake manifold. This gauge activates a temp. meter in the instrument cluster. When installing, wind sealing tape on gauge thread and tighten it.

Tightening Torque

(a): 6–10 N·m (0.6–1.0 kg·m, 4.5–7.0 lb·ft)

DIAGNOSIS

Condition	Possible Cause	Correction
Engine overheats	<ul style="list-style-type: none"> • Loose or broken water pump belt • Not enough coolant • Faulty thermostat • Faulty water pump • Dirty or bent radiator fins • Coolant leakage on cooling system • Defective cooling fan • Plugged radiator • Faulty radiator cap • Maladjusted ignition timing • Dragging brakes • Slipping clutch 	<p>Adjust or replace.</p> <p>Check coolant level and add as necessary.</p> <p>Replace.</p> <p>Replace.</p> <p>Clean or remedy.</p> <p>Repair.</p> <p>Check and replace as necessary.</p> <p>Check and replace radiator as necessary.</p> <p>Replace.</p> <p>Adjust.</p> <p>Adjust brake.</p> <p>Adjust or replace.</p>

60A50-6B-6-1S

MAINTENANCE

COOLANT

The coolant recovery system is standard. The coolant in the radiator expands with heat, and the overflow is collected in the reservoir tank.

When the system cools down, the coolant is drawn back into the radiator.

The cooling system has been filled at the factory with a quality coolant that is either 50/50 mixture of water and GOLDEN CRUISER 1200 (ethylene glycol antifreeze) or 30/70 mixture of water and GOLDEN CRUISER 1200.

The 50/50 mixture coolant solution provides freezing protection to -36°C (-33°F), the 30/70 mixture coolant solution provides freezing protection to -16°C (3°F), and it has been formulated to be used for two full calendar years or 40,000 km, whichever occurs first, of normal operation without replacement, provided the proper concentration of coolant is maintained.

60A50-6B-6-2S

GOLDEN CRUISER 1200—“Anti-freeze and Summer Coolant”—its effects

- 1) Its freezing temperature is much lower and depends on the concentration of GOLDEN CRUISER 1200. It is an anti-freeze coolant.
- 2) It does not corrode the metal surfaces of the cooling circuit. It is an anti-corrosion coolant.
- 3) It does not develop foam or bubbles. It is a foam-inhibited coolant.

NOTE:

When changing the engine coolant, use mixture of 50% water and 50% GOLDEN CRUISER 1200 for the market where ambient temperature falls lower than -16°C (3°F) in winter and mixture of 70% water and 30% GOLDEN CRUISER 1200 for the market where ambient temperature doesn't fall lower than -16°C (3°F).

ANTI-FREEZE PROPORTIONING CHART

For manual transmission model

Freezing temperature	°C	-16	-36
	°F	3	-33
Anti-freeze/Anti-corrosion coolant concentration	%	30	50
	Itr.	1.53/3.57	2.55/2.55
	US pt.	3.24/7.56	5.40/5.40
	Imp. pt.	2.70/6.30	4.50/4.50

COOLANT CAPACITY	
Engine, radiator and heater	4.5 liters (9.5/7.9 US/Imp pt.)
Reservoir tank	0.6 liters (1.3/1.1 US/Imp pt.)
Total	5.1 liters (10.8/9.0 US/Imp pt.)

For automatic Transmission model

Freezing temperature	°C	-16	-36
	°F	3	-33
Anti-freeze/Anti-corrosion coolant concentration	%	30	50
	Itr.	1.50/3.50	2.50/2.50
	Us pt.	3.18/7.42	5.30/5.30
	Imp. pt.	2.64/6.16	4.40/4.40

COOLANT CAPACITY	
Engine, radiator and heater	4.4 liters (9.3/7.7 US/Imp pt.)
Reservoir tank	0.6 liters (1.3/1.1 US/Imp pt.)
Total	5.0 liters (10.6/8.8 US/Imp pt.)

NOTE:

- Alcohol or methanol base coolant or plain water alone should not be used in cooling system at any time as damage to cooling system could occur.
- Even in a market where no freezing temperature is anticipated, mixture of 70% water and 30% ethylene glycol antifreeze (Antifreeze/Anticorrosion coolant) should be used for the purpose of corrosion protection and lubrication.

COOLANT LEVEL

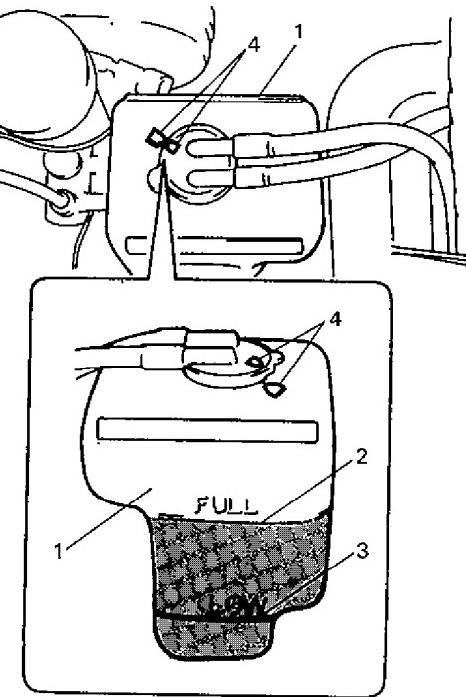
To check level, look at "see-through" water reservoir tank. It is not necessary to remove radiator cap to check coolant level.

WARNING:

To help avoid danger of being burned:

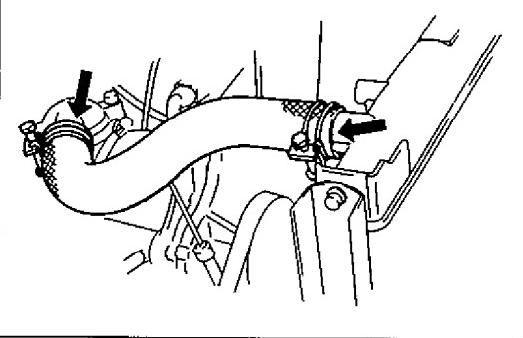
- do not remove reservoir tank cap while coolant is "boiling", and
- do not remove radiator cap while engine and radiator are still hot.

Scalding fluid and steam can be blown out under pressure if either cap is taken off too soon.



1. Reservoir tank
2. FULL level mark
3. LOW level mark
4. Arrow mark

060A50-6B-8-1S



60A50-6B-8-4S

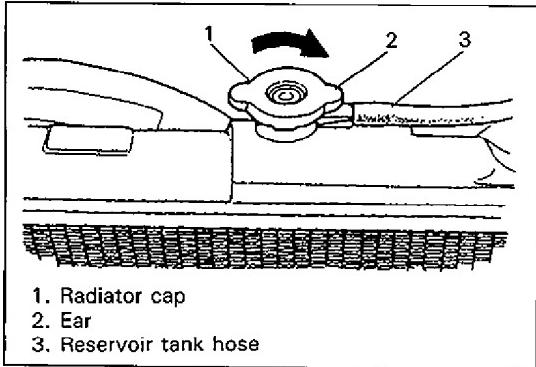
COOLING SYSTEM SERVICE

WARNING:

To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

Cooling system should be serviced as follows.

1. Check cooling system for leakage or damage.
2. Wash radiator cap and filler neck with clean water by removing radiator cap when engine is cold.
3. Check coolant for proper level and freeze protection.
4. Using a pressure tester, check system and radiator cap for proper pressure holding capacity 0.9 kg/cm^2 (12.8 psi, 90 kPa). If replacement of cap is required, use proper cap specified for this vehicle.



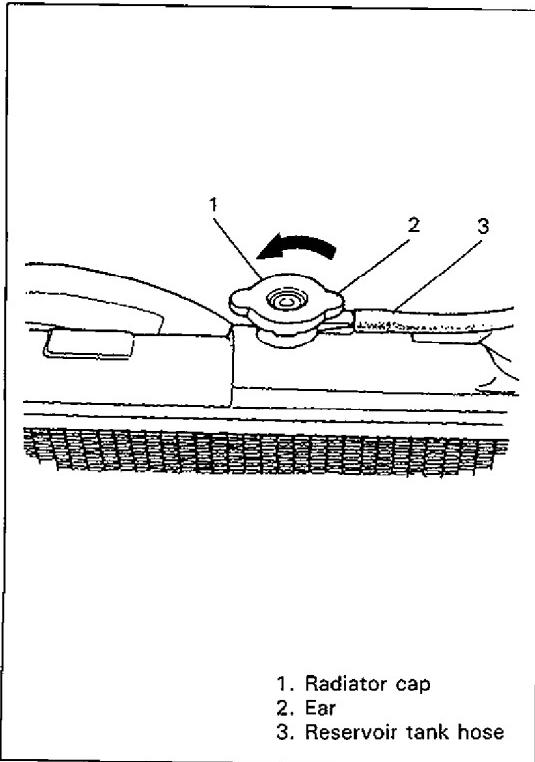
60A50-6B-9-1S

NOTE:

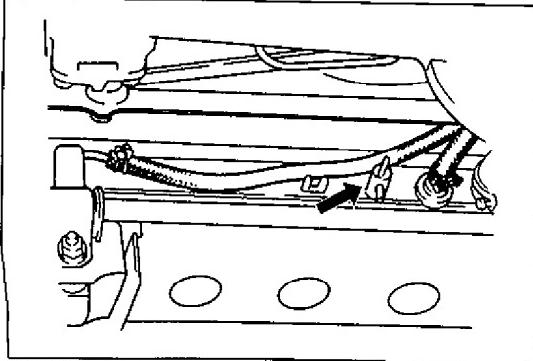
After installing radiator cap to radiator, make sure that its ear is aligned with reservoir tank hose as shown in figure. If not, turn cap more to align its ear with hose.

5. Check hose clamps for tightness and all hoses for cracks, swollen and deterioration.
6. Clean frontal area of radiator core.

60A50-6B-9-2S



60A50-6B-9-3S



60A50-6B-9-5S

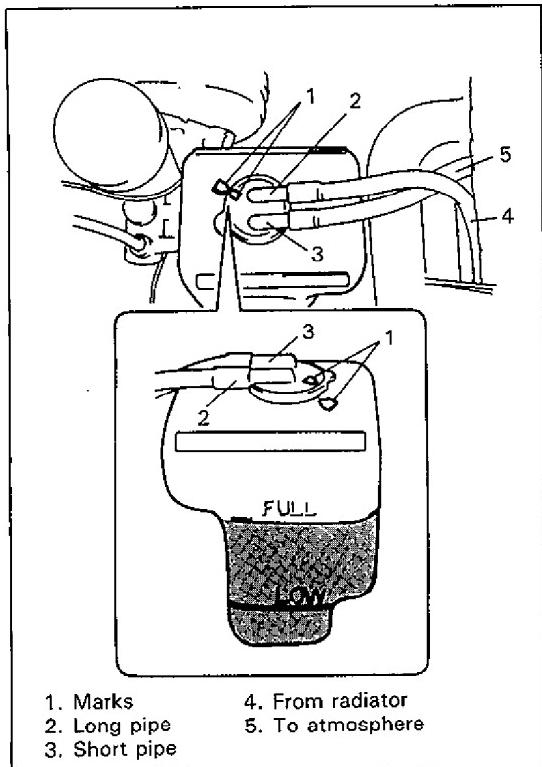
COOLING SYSTEM FLUSH AND REFILL

1. Remove radiator cap when engine is cool:
Turn cap slowly to the left until it reaches a "Stop" (Do not press down while turning it.)
Wait until pressure is relieved (indicated by a hissing sound) then press down on cap and continue to turn it to the left.

WARNING:

To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

2. With radiator cap removed, run engine until upper radiator hose is hot (this shows that thermostat is open and coolant is flowing through system).
3. Stop engine and open radiator drain plug to drain coolant.
4. Close drain plug. Add water until system is filled and run engine until upper radiator hose is hot again.
5. Repeat steps 3 and 4 several times until drained liquid is nearly colorless.
6. Drain system and then close radiator drain plug tightly.



60A50-6B-10-1S

7. Disconnect hose from water reservoir tank. Remove tank and pour out any fluid. Scrub and clean inside of tank with soap and water. Flush it well with clean water and drain. Reinstall tank and hose.
8. Add 50/50 mixture of good quality ethylene glycol antifreeze and water to radiator and tank. Fill radiator to the base of radiator filler neck and reservoir tank to "FULL" level mark. Reinstall reservoir tank cap, aligning the arrow marks on the tank and cap.

60A50-6B-10-3S

9. Run engine, with radiator cap removed, until radiator upper hose is hot.
10. With engine idling, add coolant to radiator until level reaches the bottom of filler neck. Install radiator cap, making sure that the ear of cap lines up with reservoir tank hose.

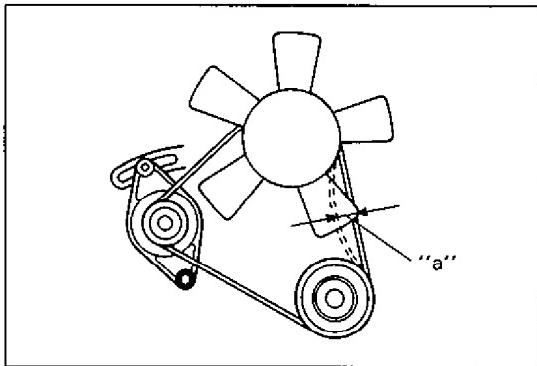
WATER PUMP BELT TENSION

WARNING:

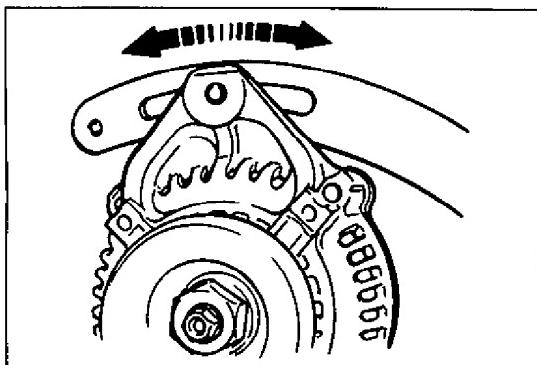
Disconnect negative cable at battery before checking and adjusting belt tension.

1. Inspect belt for cracks, cuts, deformation, wear and cleanliness. If it is necessary to replace belt, refer to page 6B-14 for procedure.

60A50-6B-11-1S



60A50-6B-11-2S



60A50-6B-11-3S

2. Check belt for tension. Belt is in proper tension when it deflects 6 to 8 mm (0.24–0.32 in.) under thumb pressure (about 10 kg or 22 lb.).

Belt tension "a":

6–8 mm (0.24–0.32 in.) as deflection/10 kg (22 lbs)

NOTE:

When replacing belt with a new one, adjust belt tension to 5–7 mm (0.20–0.27 in.).

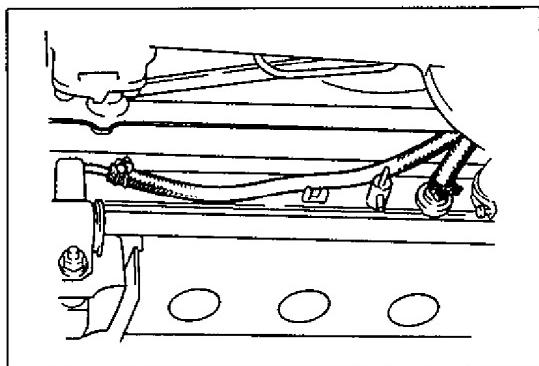
3. If belt is too tight or too loose, adjust it to proper tension by displacing generator position.
4. Tighten generator adjusting bolt and pivot bolts.
5. Connect negative cable at battery terminal.

ON VEHICLE SERVICE

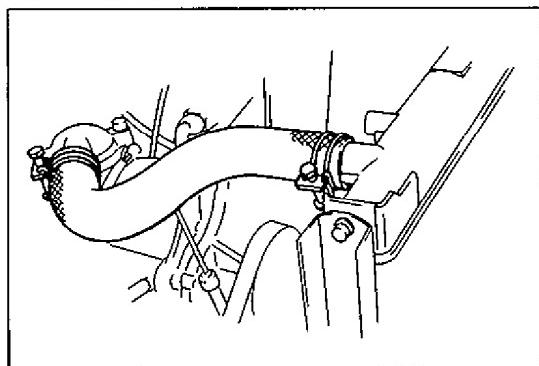
WARNING:

- Check to make sure that cooling water temperature is cold before removing any part of cooling system.
- Also be sure to disconnect negative cable from battery before removing any part.

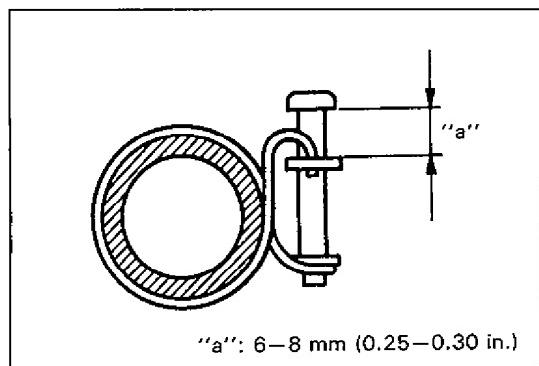
60A50-6B-12-1S



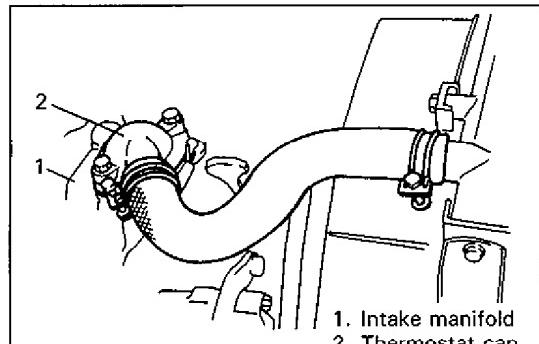
60A50-6B-12-2S



60A50-6B-12-3S



60A50-6B-12-4S



COOLANT DRAINING

1. Remove radiator cap.
2. Loosen drain plug on radiator to drain coolant.
3. After draining coolant, be sure to tighten drain plug securely.
4. Fill cooling system. (Refer to pages 6B-9 & 6B-10.)

COOLING WATER PIPES OR HOSES

REMOVAL

1. Drain cooling system.
2. To remove these pipes or hoses, loosen screw on each pipe or hose clip and pull hose end off.

INSTALLATION

Install removed parts in reverse order of removal procedure, noting the following.

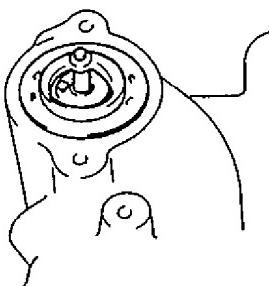
- Tighten each clamp bolt securely.
- Refill cooling system with proper coolant, referring to description on COOLANT on pages 6B-9 and 6B-10.
- After installation, check each joint for leakage.

THERMOSTAT

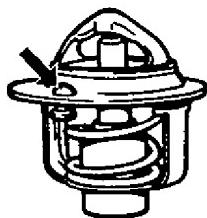
REMOVAL

1. Drain cooling system and tighten drain plug.
2. Disconnect thermostat cap from intake manifold.

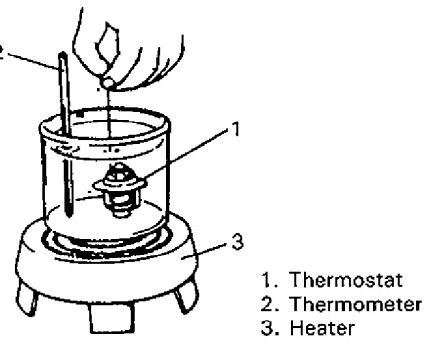
- Remove thermostat.



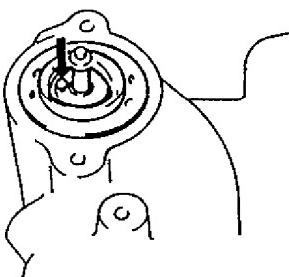
60A50-6B-13-1S



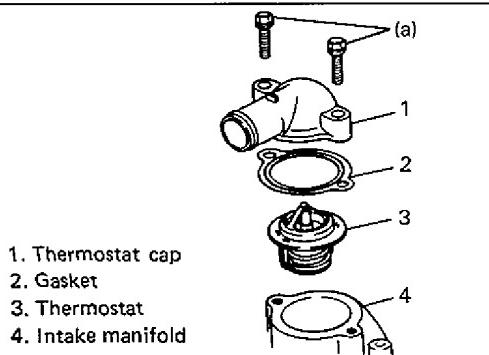
60A50-6B-13-2S



60A50-6B-13-3S



60A50-6B-13-4S



INSPECTION

- Make sure that air bleed valve of thermostat is clear. Should this valve be clogged, engine would tend to overheat.
- Check to make sure that valve seat is free from foreign matters which would prevent from seating tight.

- Check thermostatic movement of wax pellet as follows:
 - Immerse thermostat in water, and heat water gradually.
 - Check that valve starts to open at specific temperature.
 - If valve starts to open at a temperature substantially below or above specific temperature, thermostat unit should be replaced with a new one. Such a unit, if re-used, will bring about overcooling or overheating tendency.

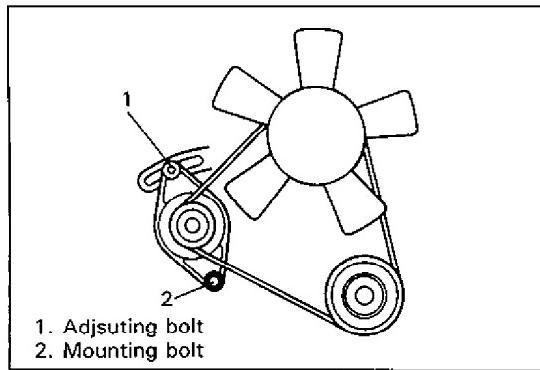
INSTALLATION

- When positioning thermostat on intake manifold, be sure to bring its air bleed valve to front side of engine.
- Install new gasket and thermostat cap to intake manifold. Then tighten thermostat cap bolts to specified torque.

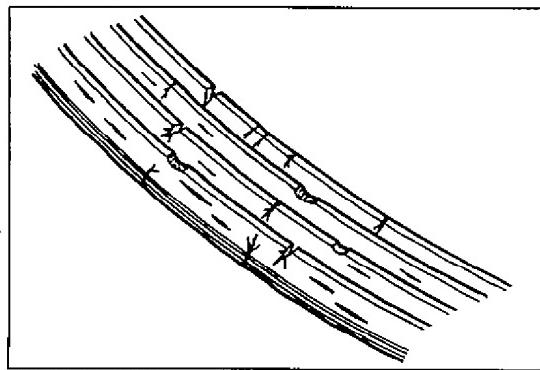
Tightening Torque

(a): 10–16 N·m, (1.0–1.6 kg-m, 7.5–11.5 lb-ft)
- Fill cooling system. (Refer to pages 6B-9 and 6B-10.)

60A50-6B-13-5S



60A50-6B-14-1S



60A50-6B-14-2S

WATER PUMP BELT

REMOVAL

1. Disconnect negative cable at battery.
2. Loosen drive belt adjusting bolt and mounting bolts. When servicing vehicle equipped with air conditioner, remove compressor drive belt before removing water pump belt.
3. Slacken belt by displacing generator and then remove it.

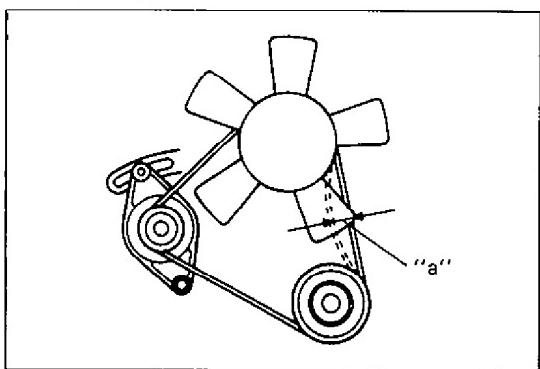
INSPECTION

- Inspect pump belt for wear or cracks, cuts, deformation and cleanliness.
If it is necessary, replace belt.

INSTALLATION

1. Install belt to water pump pulley, crankshaft pulley and generator pulley.
When servicing vehicle equipped with air conditioner, install compressor drive belt, too.
2. Adjust belt tension as specified below.
For Adjustment of compressor drive belt tension, refer to SECTION OB of this manual.
3. Tighten water pump belt adjusting bolt and mounting bolts.
4. Connect negative cable at battery.

60A50-6B-14-3S



60A50-6B-14-4S

WATER PUMP BELT TENSION INSPECTION

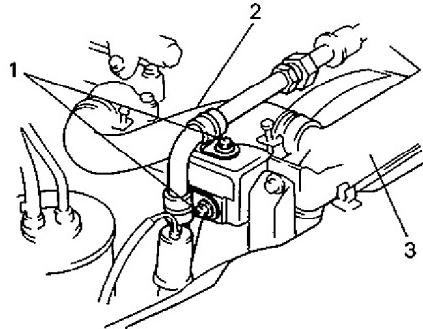
1. Check belt tension. It should be within specification. Refer to page 6B-11.
2. If tension is out of specification, adjust it.
For its adjustment, refer to WATER PUMP BELT TENSION on page 6B-11.
After adjustment, be sure to tighten bolts.

COOLING FAN, FAN CLUTCH AND WATER PUMP PULLEY

REMOVAL

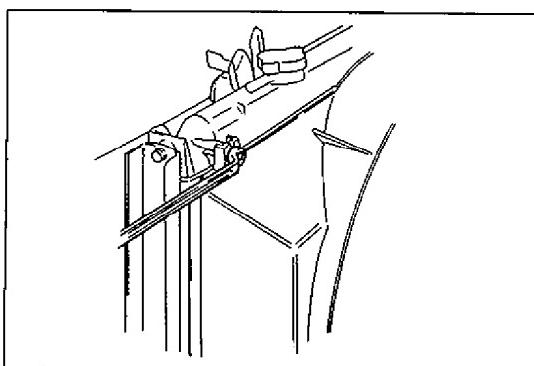
1. Disconnect negative battery cable at battery.
2. If equipped with air conditioner or power steering system, drain cooling system by loosening drain plug of radiator.
3. If equipped with air conditioner or power steering system, disconnect radiator inlet hose from radiator.

- When servicing vehicle equipped with air conditioner, remove air conditioner pipe mounting bolts.

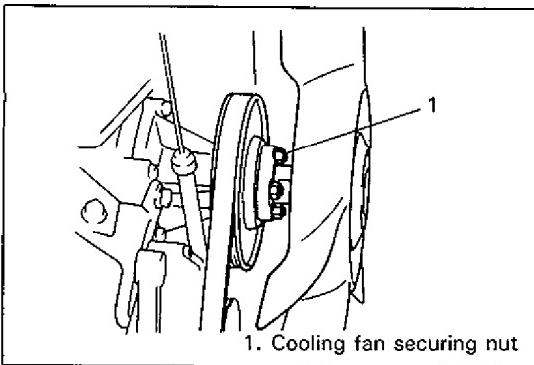


1. Air conditioner pipe mounting bolt
2. Inlet hose
3. Radiator

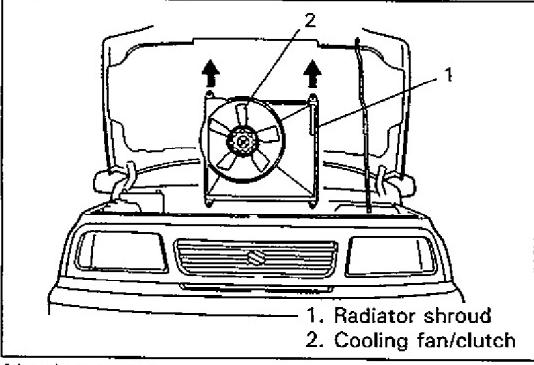
60A50-6B-15-1S



60A50-6B-15-3S



60A50-6B-15-4S



60A50-6B-15-5S

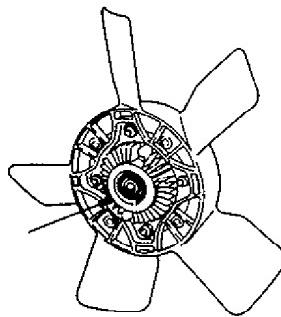
4. Remove radiator shroud securing bolts (4 pcs).

5. Remove cooling fan securing nuts and loosen water pump belt tension.

6. Remove cooling fan/clutch, radiator shroud and water pump pulley.

WARNING:

Be careful not to damage radiator fins.

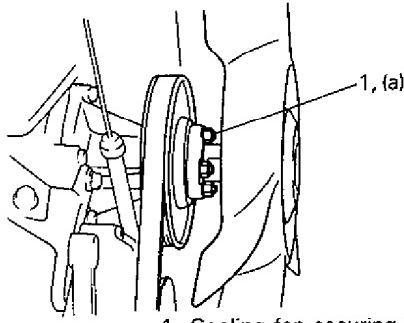


60A50-6B-16-1S

INSPECTION

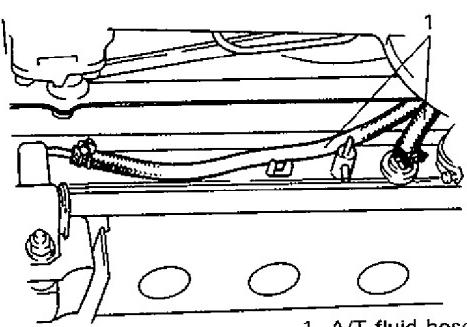
Inspect fluid coupling for oil leakage.

If necessary, replace fan clutch assembly. Do not disassemble clutch assembly.



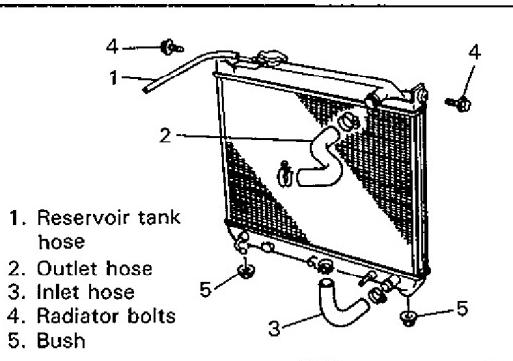
1. Cooling fan securing nut

60A50-6B-16-2S

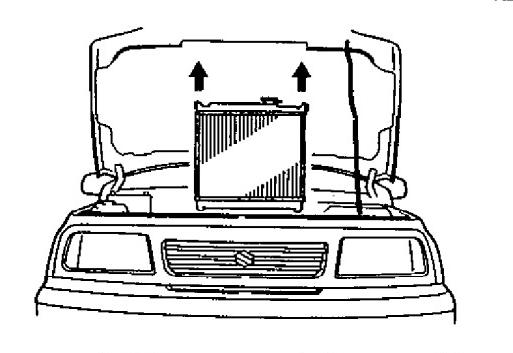


1. A/T fluid hoses

60A50-6B-16-3S



60A50-6B-16-4S



60A50-6B-16-5S

INSTALLATION

Install removed parts in reverse order of removal procedure.

- After installation, adjust belt tension for specification and tighten each bolt and nut securely.

Tightening Torque

(a): 9–12 N·m (0.9–1.2 kg·m, 7.0–8.5 lb·ft)

- Refill cooling system with proper coolant referring to COOLANT section on pages 6B-10 and 6B-11.

RADIATOR

REMOVAL

1. Disconnect negative cable at battery.
2. Drain cooling system by loosening drain plug of radiator.
3. When servicing vehicle equipped with A/T (Automatic Transmission), place oil pan under radiator and disconnect A/T fluid hoses from radiator.

4. Remove cooling fan/clutch and radiator shroud as previously outlined.

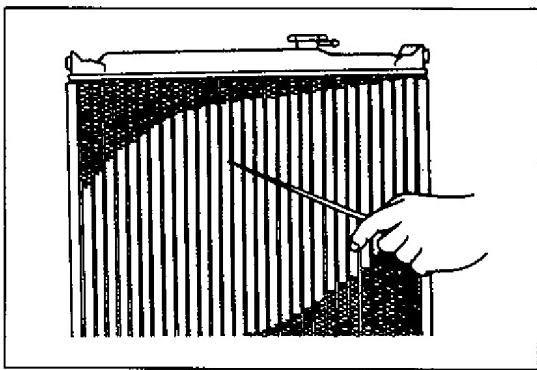
5. Disconnect reservoir tank hose, outlet hose and inlet hose from radiator.

6. Remove radiator.

INSPECTION

Check radiator for leakage or damage. Straighten bent fins, if any.

60A50-6B-17-1S



60A50-6B-17-2S

CLEAN

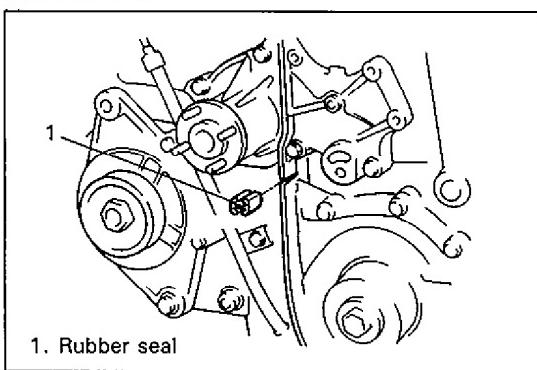
Clean frontal area of radiator cores.

INSTALLATION

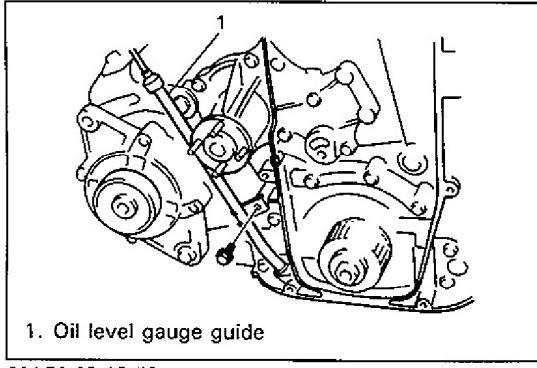
Install in reverse order of removal noting the following.

- Refill cooling system with proper coolant referring to pages 6B-9 and 6B-10.
- Adjust water pump belt tension to specification. (For specified tension, refer to page 6B-11.)
- With A/T (Automatic Transmission) equipped vehicle, check A/T fluid level, referring to SECTION 7B1.
- After installation, check each joint for leakage.

60A50-6B-17-3S



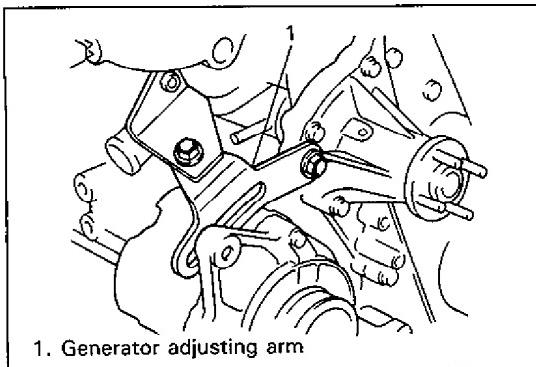
60A50-6B-17-4S



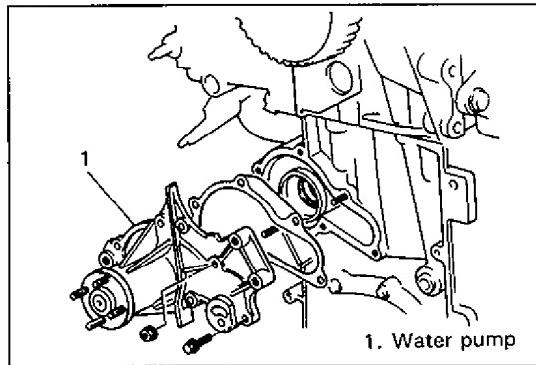
60A50-6B-17-5S

WATER PUMP**REMOVAL**

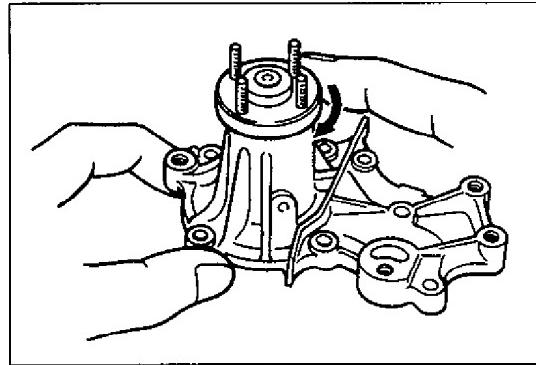
1. Disconnect negative cable at battery.
2. Drain cooling system.
3. Remove timing belt and tensioner according to procedure described in item "TIMING BELT AND TENSIONER" of SECTION 6A1.
4. Remove rubber seal between oil pump and water pump.
5. Remove oil level gauge guide with oil level gauge.



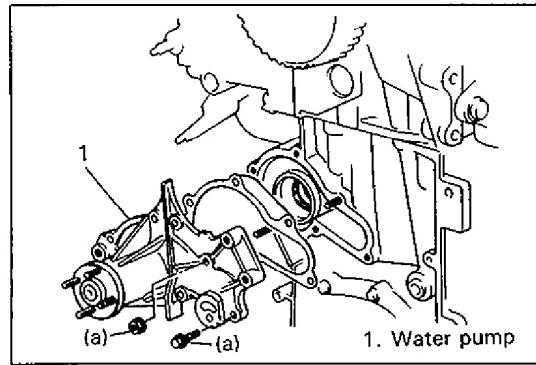
60A50-6B-18-1S



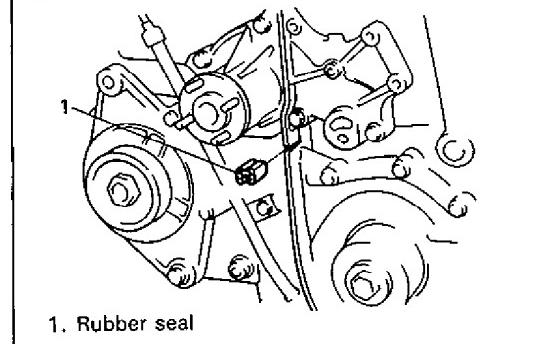
60A50-6B-18-2S



60A50-6B-18-3S



60A50-6B-18-4S



6. Remove generator adjusting arm.

7. Remove water pump assembly.

NOTE:

Do not disassemble water pump.

If any repair is required on pump, replace it as assembly.

INSPECTION

Rotate water pump by hand to check for smooth operation. If pump does not rotate smoothly or makes abnormal noise, replace it.

INSTALLATION

1. Install new pump gasket to cylinder block.
2. Install water pump to cylinder block.

Tightening Torque

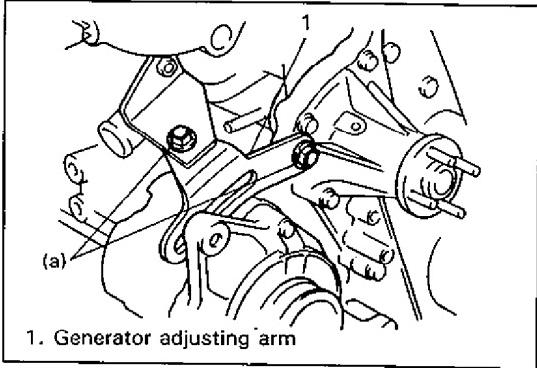
(a): 10–13 N·m (1.0–1.3 kg·m, 7.5–9.0 lb·ft)

3. After installing water pump, install rubber seal between water pump and oil pump.

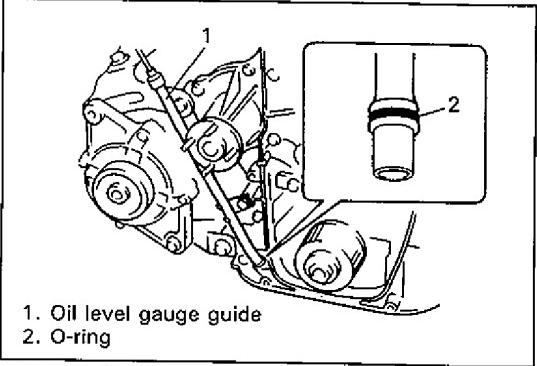
60A50-6B-18-5S

4. Install belt tensioner, timing belt and timing belt outside cover according to procedure described in item "TIMING BELT AND TENSIONER" of SECTION 6A1.

60A50-6B-19-1S



60A50-6B-19-2S



60A50-6B-19-3S

5. Install generator adjusting arm.

Tightening Torque

(a): 18–28 N·m (1.8–2.8 kg·m, 13.5–20.0 lb·ft)

6. With engine oil applied to O-ring, install oil level gauge guide.

7. Install crankshaft pulley, water pump pulley, pump drive belt, cooling fan/clutch and radiator shroud.

Tightening Torque

Cooling fan/clutch nuts, Crankshaft pulley No.2 bolts:
9–12 N·m (0.9–1.2 kg·m, 7.0–8.5 lb·ft)

60A50-6B-19-4S

8. Adjust water pump belt tension. (Refer to page 6B-11.)
9. Connect negative cable at battery.
10. Fill cooling system. (Refer to pages 6B-9 and 6B-10.)
11. After installation, check each part for leakage.

60A50-6B-19-5S

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Ethylene glycol anti-freeze	GOLDEN CRUISER 1200 (Anti-freeze/Anti-corrosion coolant)	Additive to engine cooling system for improving cooling efficiency and for protection against rusting.

60A50-6B-20-1S

SECTION 6C

ENGINE FUEL

CONTENTS

GENERAL DESCRIPTION	6C-1	ON VEHICLE SERVICE	6C-3
Fuel System	6C-1	Fuel Pump	Refer to SECTION 6E1
Fuel Tank	6C-2	Fuel Filter	6C-3
Fuel Pump	Refer to SECTION 6E1	Fuel Lines	6C-4
Fuel Filter	6C-2	Fuel Filler Cap	6C-5
Fuel Filler Cap	6C-2	Fuel Tank	6C-5
RECOMMENDED TORQUE SPECIFICATIONS			
			6C-7

60A50-6C-1-1S

CAUTION:

Be sure to use UNLEADED FUEL for the catalytic converter equipped vehicle.

Use of LEADED FUEL will affect performance of the catalytic converter adversely to a great extent.

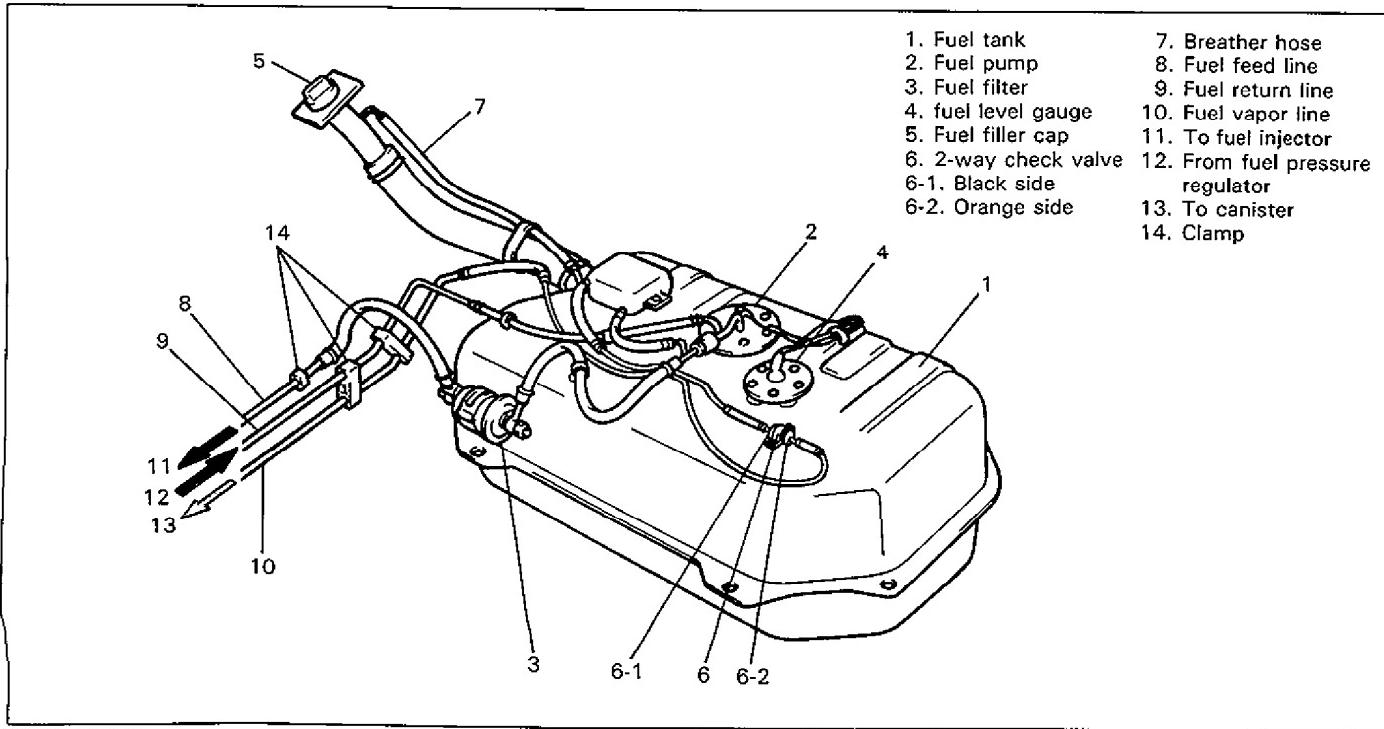
70A50-6C-1-2S

GENERAL DESCRIPTION

FUEL SYSTEM

The main components of the fuel system are fuel tank, fuel pump, fuel filter and fuel level gauge and it includes three lines; fuel feed line, fuel return line and fuel vapor line.

For the details of fuel flow and fuel vapor flow, refer to SECTION 6E1 "ELECTRONIC FUEL INJECTION SYSTEM".

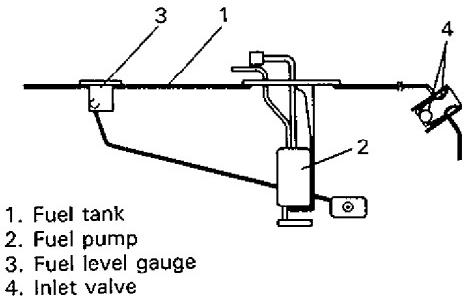


60A50-6C-1-3S

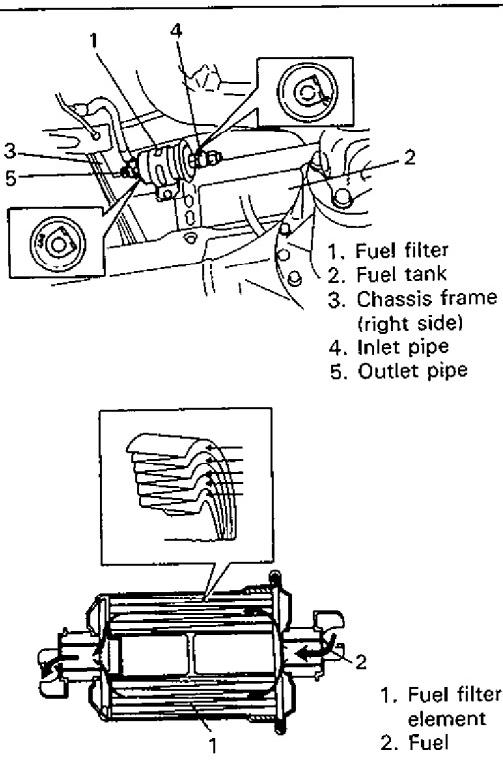
FUEL TANK

The fuel tank is located under the rear of the vehicle. The fuel pump and fuel level gauge are installed on the upper part of the fuel tank.

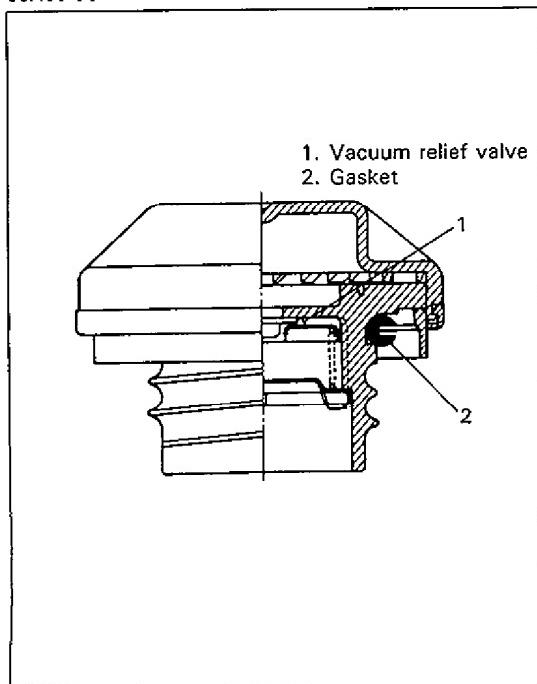
Also, the fuel tank has the inlet valve at the inlet port.



60A50-6C-2-1S



60A50-6C-2-2S



60A50-6C-2-4S

FUEL FILTER

The fuel filter is installed on the chassis frame and filters the fuel sent under pressure from the fuel pump.

As it can't be disassembled, it should be replaced as an assembly. Note that letters indicating the fuel inlet and outlet ports are stamped on the fuel filter. Check them for proper hose connection.

FUEL FILLER CAP

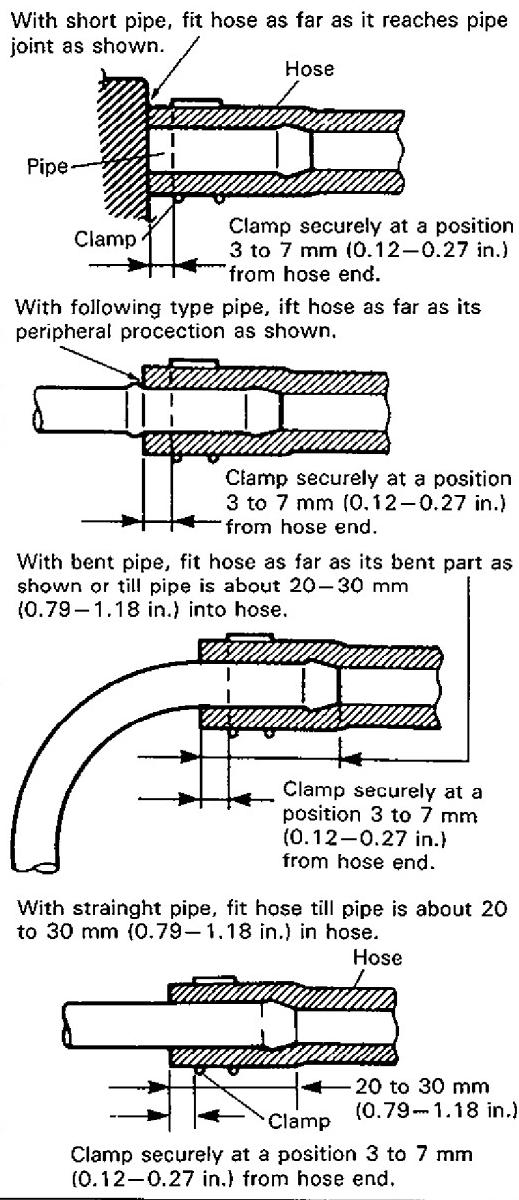
A ratchet tightening device on the threaded fuel filler cap reduces the chances of incorrect installation, which would prevent sealing fuel vapors.

After the gasket on fuel filler cap and the filler neck flange contact, the ratchet produces a loud clicking noise, indicating the seal has been set.

This cap has a vacuum relief valve inside.

When the pressure in the fuel tank becomes negative (vacuum), the vacuum is usually relieved by the two-way check valve which is included in the fuel vapor line. Only when the vacuum becomes very high, the vacuum relief valve opens.

ON VEHICLE SERVICE



60A50-6C-3-1S

WARNING:

Before attempting service of any type on fuel system, following cautions should be always observed.

- Disconnect negative cable at battery.
 - DO NOT smoke, and place "NO SMOKING" signs near work area.
 - Be sure to have CO₂ fire extinguisher handy.
 - Be sure to perform work in a well-ventilated area and away from any open flames (such as gas hot heater).
 - Wear safety glasses.
 - To release fuel vapor pressure in fuel tank, remove fuel filler cap from fuel filler neck and then reinstall it.
 - As fuel feed line is still under high fuel pressure even after engine was stopped, loosening or disconnecting fuel feed line directly may cause dangerous spout of fuel to occur where loosened or disconnected. Before loosening or disconnecting fuel feed line, make sure to release fuel pressure according to procedure described on p. 6-4.
 - A small amount of fuel may be released after the fuel line is disconnected.
- In order to reduce the chance of personal injury, cover the fitting to be disconnected with a shop cloth. Put that cloth in an approved container when disconnection is completed.
- Note that fuel hose connection varies with each type of pipe. Be sure to connect and clamp each hose correctly referring to figures.

FUEL FILTER

REMOVE OR DISCONNECT

1. Release fuel pressure in fuel feed line referring to p. 6-4.

CAUTION:

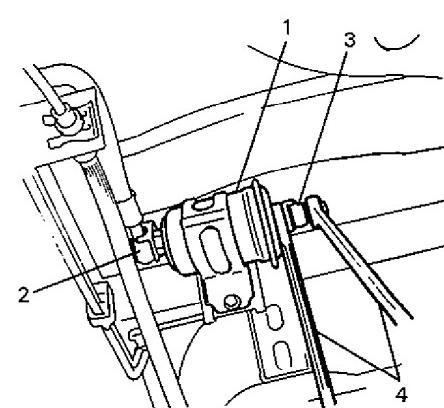
This work must not be done when engine is hot. If done so, it may cause adverse effect to catalyst.

2. Negative cable at battery.
3. Hoist vehicle.
4. Inlet and outlet pipes fuel filter by using two wrenches.

WARNING:

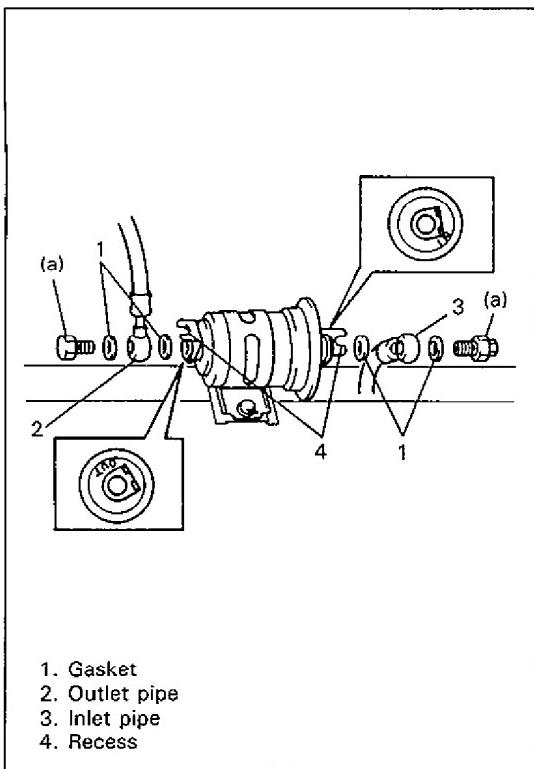
A small amount of fuel may be released after fuel line is disconnected. In order to reduce the chance of personal injury, cover the fitting to be disconnected with a shop cloth. Be sure to put that cloth in an approved container when disconnection is completed.

5. Fuel filter from chassis frame.

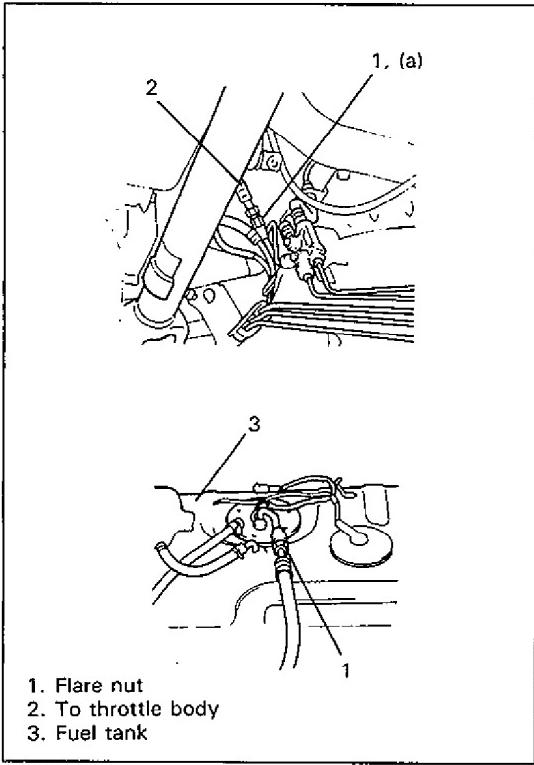


1. Fuel filter
2. Outlet pipe
3. Inlet pipe
4. Wrenches

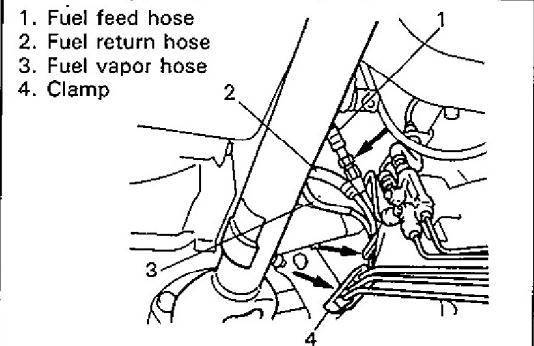
60A60-6C-3-4S



60A50-6C-4-1S



60A50-6C-4-3S



60A50-6C-4-5S

INSTALL OR CONNECT

Reverse removal procedure noting the following.

- Use new gaskets.
 - Make sure that gasketed surfaces are free from any damage.
 - Inlet and outlet pipes should come into recess of plate as shown below.
 - Tighten union bolts to specified torque.
- (a): 30–40 N·m (3.0–4.0 kg·m, 22.0–28.5 lb·ft)
- Upon completion of installation, verify that there is no fuel leakage at each connection according to procedure described in p. 6-4.

FUEL LINES

Due to the fact that fuel feed line is under high pressure, this system requires special consideration for service.

The feed pipe uses screw couplings.

Any time these fittings are loosened to service or replace components, ensure that:

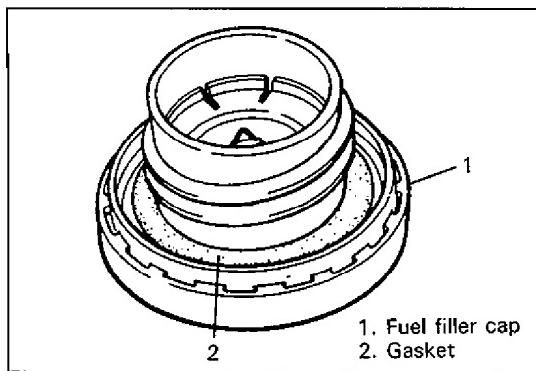
- Backup wrench is used for loosening and tightening fitting.
- Tighten fittings (flare nut) to specified torque.

(a): 40–50 N·m (4.0–5.0 kg·m, 29.0–36.0 lb·ft)

INSPECT

Visually inspect fuel lines for evidence of fuel leakage, hose cracking and deterioration, or damage. Make sure all clamps are secure.

Replace parts as needed.



60A50-6C-5-1S

FUEL FILLER CAP

Remove cap, and check gasket for even filler neck imprint, and deterioration or any damage. If gasket is in malcondition, replace cap.

NOTE:

If cap requires replacement, only a cap with the same features should be used. Failure to use correct cap can result in serious malfunction of the system.

FUEL TANK

REMOVAL

1. Release fuel pressure in fuel feed line referring to p. 6-4.

CAUTION:

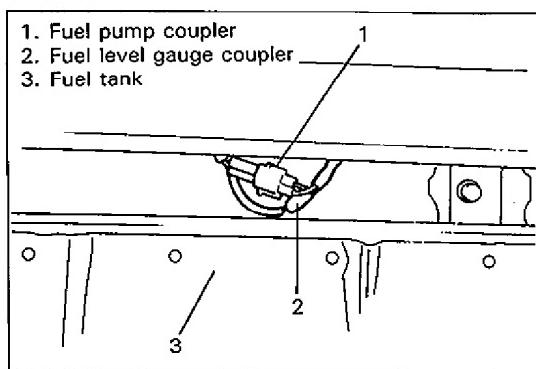
This work must not be done when engine is hot. If done so, it may cause adverse effect to catalyst.

2. Disconnect negative cable at battery.
3. Disconnect fuel level gauge and fuel pump lead wire couplers after removing rear bumper cover.
4. Remove fuel tank filler hose cover, filler hose and fuel tank inlet valve.
5. As there is no fuel tank drain plug, drain fuel tank by pumping fuel out through fuel tank filler.
Use hand operated pump device to drain fuel tank.

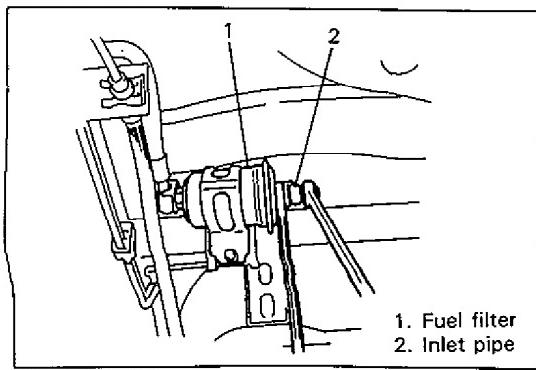
CAUTION:

Never drain or store fuel in an open container due to possibility of fire or explosion.

60A50-6C-5-2S

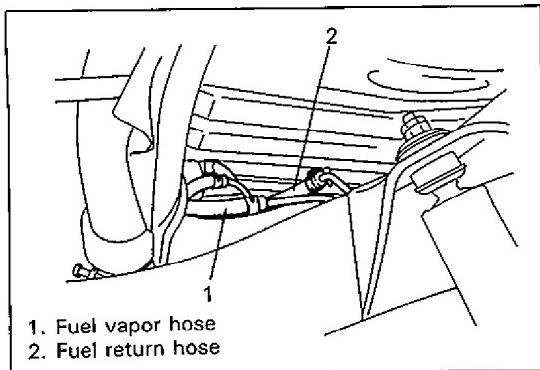


60A50-6C-5-3S



60A50-6C-5-5S

6. Disconnect fuel filter inlet pipe from filter.



60A50-6C-6-1S

7. Disconnect fuel vapor hose and return hose from pipes.
8. Remove fuel tank protector.
9. Remove fuel tank and cover from vehicle.

60A50-6C-6-2S

FUEL TANK PURGING PROCEDURE

CAUTION:

This purging procedure will NOT remove all fuel vapor.
Do not attempt any repair on tank where heat or flame
is required, as an explosion resulting in personal injury
could occur.

The following procedure is used for purging the fuel tank.

1. After removing fuel tank, removal all hoses, 2-way check valve, fuel separator, fuel pump and fuel level gauge from fuel tank.
2. Drain all remaining fuel from tank.
3. Move tank to flushing area.
4. Fill tank with warm water or tap water, and agitate vigorously and drain. Repeat this washing until inside of tank is clean.
Replace tank if its inside is rusty.
5. Completely flush out remaining water after washing.

60A50-6C-6-3S

INSTALLATION

1. Install fuel pump and fuel level gauge to fuel tank.
Use new gaskets.
2. Install fuel separator, inlet valve and 2-way check valve to fuel tank directing 2-way check valve black nozzle toward fuel separator. Refer to page 6C-1.
3. Install fuel hoses to fuel tank, fuel pump, 2-way check valve and separator.
After connecting, clamp hoses securely. Refer to page 6C-1.
4. Install fuel tank and cover to vehicle.
5. Connect fuel filler hose and breather hose to fuel filler neck. Clamp them securely.
6. Connect fuel vapor hose and return hose to fuel pipe.
Clamp them securely.
7. Connect fuel filter inlet pipe to fuel filter.
Use new gaskets and tighten union bolt to specification.
8. Install fuel filler hose cover.
9. Connect fuel pump and level gauge couplers.
10. Install rear bumper cover.
11. Connect negative cable to battery.
12. Upon completion of installation, check fuel system for leakage referring to p. 6-4.

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RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg·m	lb·ft
Fuel filter union bolt	30—40	3.0—4.0	22.0—28.5
Blind plug of fuel filter union bolt	9—11	0.9—1.1	7.0—7.5
Flare nut of fuel pipe	40—50	4.0—5.0	29.0—36.0

60A50-6C-7-2S

SECTION 6E1

ELECTRONIC FUEL INJECTION SYSTEM (MULTI-POINTS)

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GENERAL DESCRIPTION

The Electronic Fuel Injection System in this vehicle supplies the combustion chambers with air/fuel mixture of optimized ratio under widely varying driving conditions.

It uses the multi-point fuel injection system which injects fuel into the each intake port of the cylinder head.

This system has 3 major sub-systems: air intake system, fuel delivery system and electronic control system.

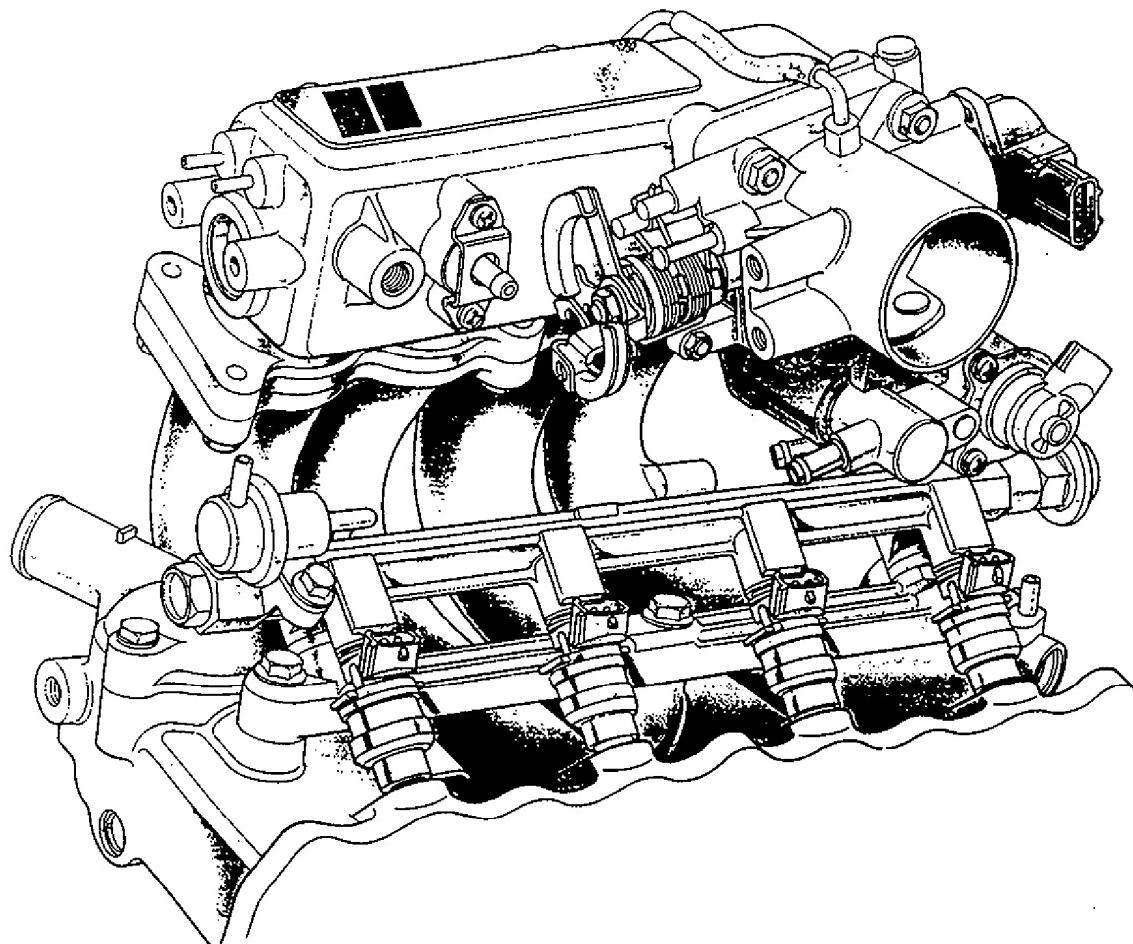
Air intake system includes air cleaner, air flow meter, throttle body, air valve, ISC solenoid valve and intake manifold.

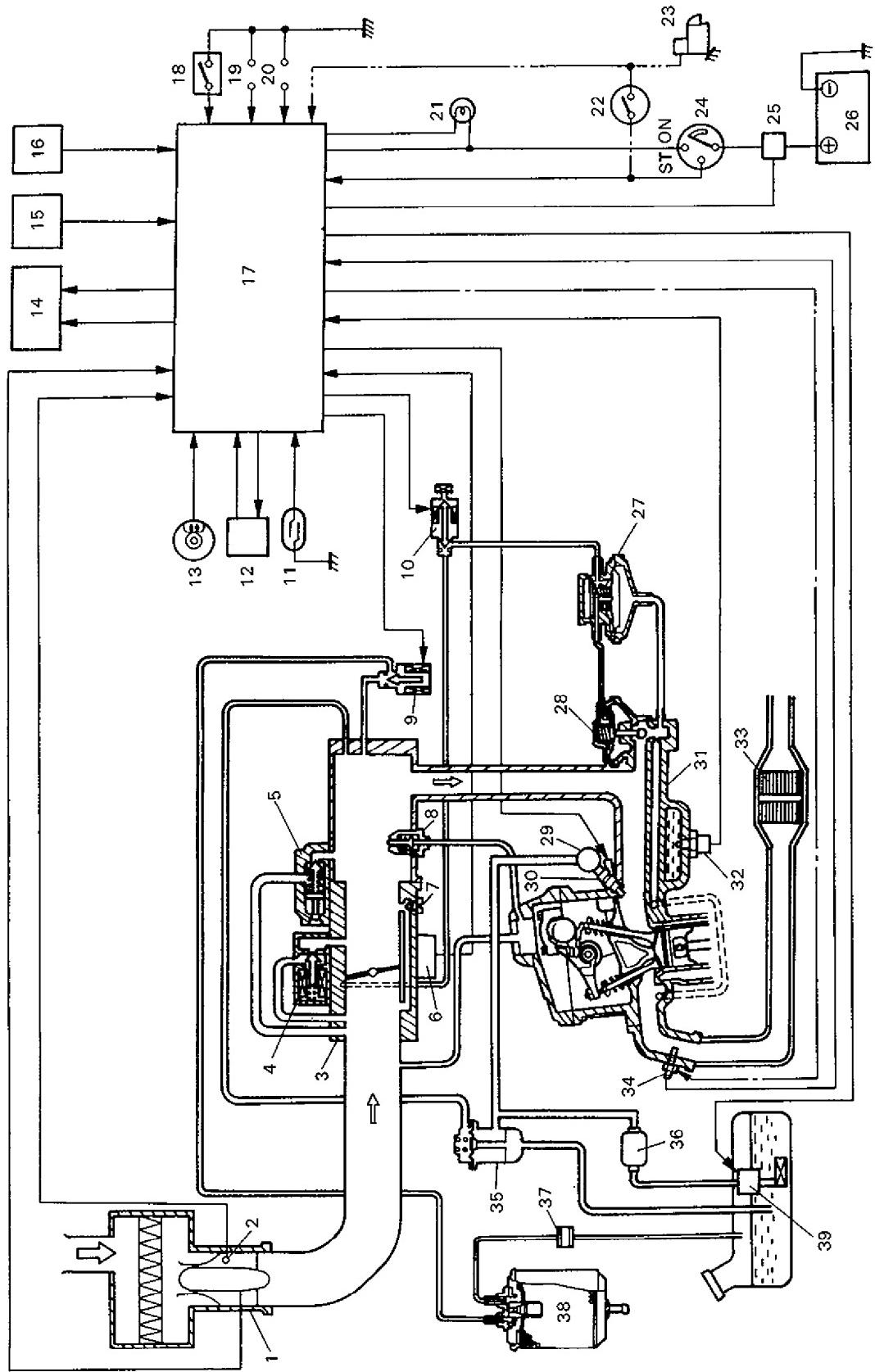
Fuel delivery system includes fuel pump, delivery pipe, fuel pressure regulator, etc.

Electronic control system includes ECM, various sensors and controlled devices.

This section explains the system related to the electronic fuel injection as well as such functions of ECM as listed below.

- EGR control system. (if equipped)
- Evaporative emission control system.
- Throttle valve opening signal and cooling water temp. signal outputs for A/T.
- ESA (Electronic Spark Advance) system.





1. AFM
2. ATS
3. Throttle body
4. ISC solenoid valve
5. Air valve
6. TPS
7. Idle speed adjusting screw
8. PCV valve
9. Canister purge VSV
10. EGR VSV (if equipped)
11. VSS
12. Igniter
13. CAS
14. A/T controller (A/T only)
15. A/C amplifier (if equipped)
16. Electric load
(Headlights, small lights,
Heater fan and rear window
defogger)
17. ECM
18. Power steering pressure
switch (if equipped)
19. Test switch terminal
20. Diag. switch terminal
21. "CHECK ENGINE" light
22. Shift switch (A/T only)
23. Starter magnetic switch
24. Main switch
25. Main fuse
26. Battery
27. EGR modulator (if equipped)
28. EGR valve (if equipped)
29. Fuel delivery pipe
30. Fuel injector
31. Intake manifold
32. VTS
33. Catalytic converter
(if equipped)
34. Oxygen sensor (if equipped)
35. Fuel pressure regulator
36. Fuel filter
37. 2-way check valve
38. Charcoal canister
39. Fuel pump

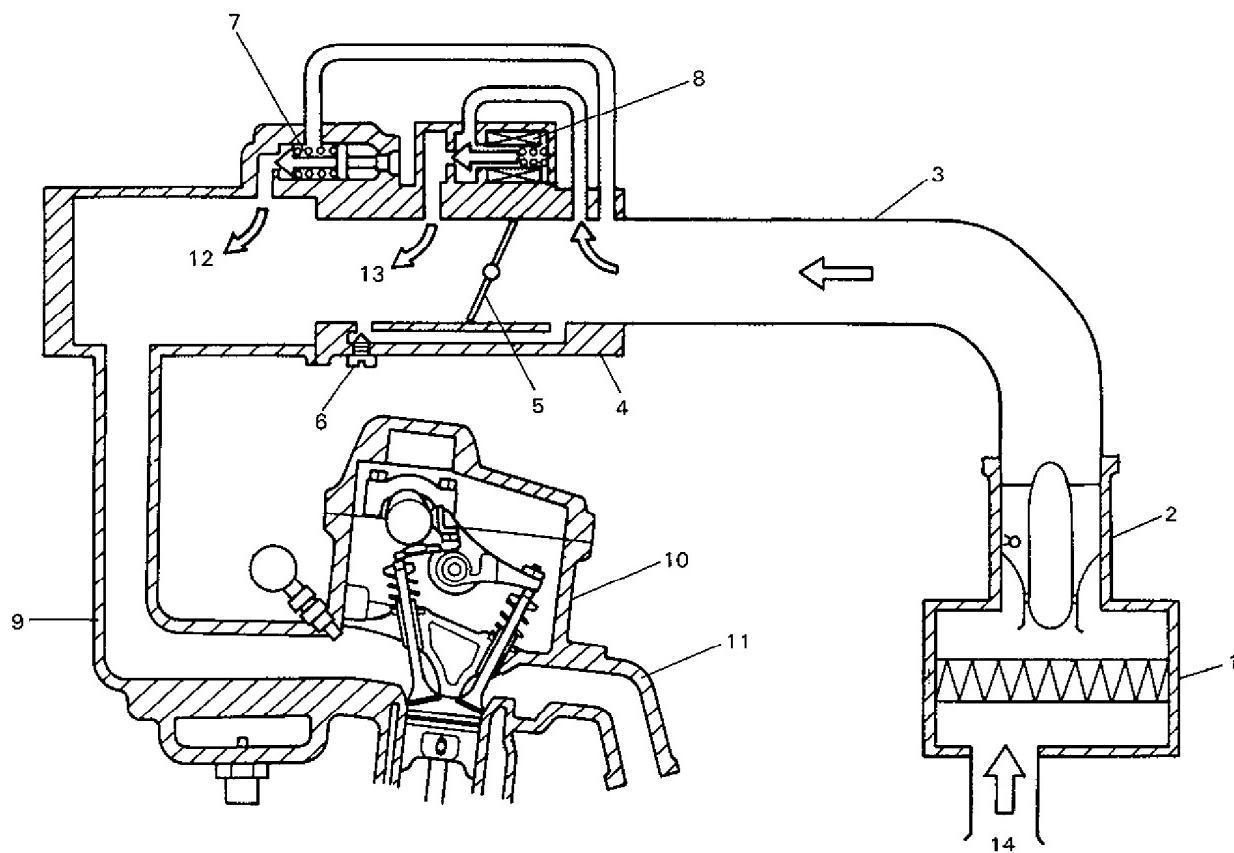
60A50-6E1-5-1S

AIR INTAKE SYSTEM

The main components of the air intake system are air cleaner, air flow meter, air intake pipe, throttle body, air valve, ISC solenoid valve and intake manifold.

The air (by the amount corresponding to the throttle valve opening and engine speed) is filtered by the air cleaner, passes through the throttle body, is distributed by the intake manifold and finally drawn into each combustion chamber.

When the engine is idling, when it is cold or when the ISC solenoid valve is opened according to the signal from ECM, the air bypasses the throttle valve through bypass passagae which varies in each case and is finally drawn into the intake manifold.

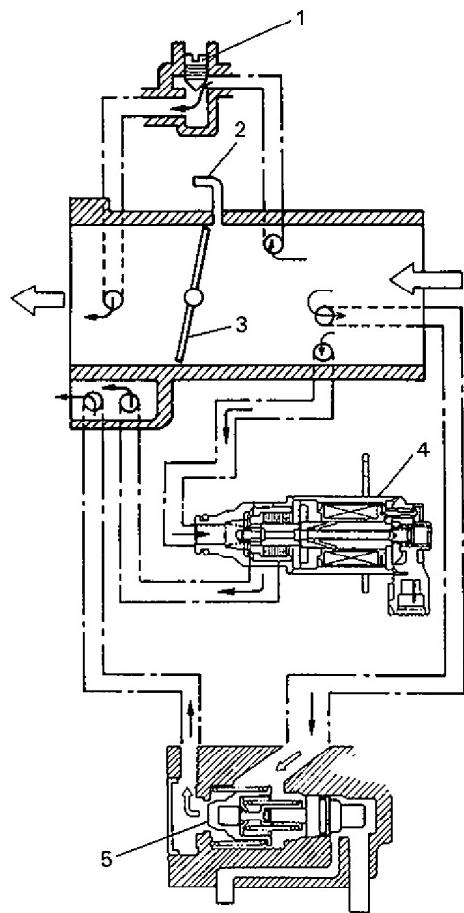


- | | | |
|-------------------------|-------------------------------|---|
| 1. Air cleaner | 6. Idle speed adjusting screw | 11. Exhaust manifold |
| 2. Air flow meter (AFM) | 7. Air valve | 12. Air flow when engine cold |
| 3. Air intake pipe | 8. ISC solenoid valve | 13. Air flow when ISC solenoid valve open |
| 4. Throttle body | 9. Intake manifold | 14. Fresh air |
| 5. Throttle valve | 10. Cylinder head | |

THROTTLE BODY

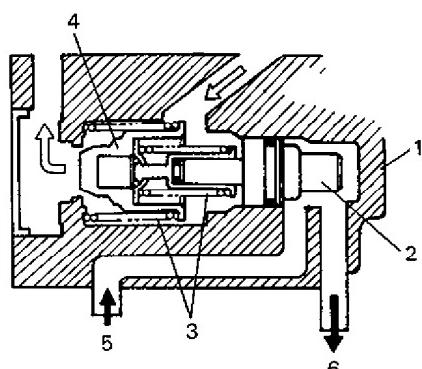
The throttle body consists of the main bore, air bypass passage, vacuum passage (for EGR system, if equipped) and the following parts.

- Throttle valve which is interlocked with the accelerator pedal and controls the amount of the intake air
- Idle speed adjusting screw which controls the amount of bypass air to adjust ISC duty (engine idle speed)
- TPS which detects the throttle valve opening and sends a signal to ECM
- Air valve which supplies the bypass air when engine is cold
- ISC solenoid valve which controls the amount of bypass air according to the signal from ECM



1. Idle speed adjusting screw
2. Vacuum passage
3. Throttle valve
4. ISC solenoid valve
5. Air valve

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1. Throttle body
2. Thermo wax
3. Springs
4. Valve
5. From intake manifold
6. To intake pipe

60A50-6E1-7-4S

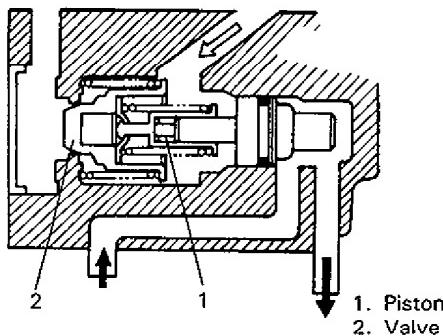
AIR VALVE

The air valve consists of thermo-wax, springs, and valve. When the engine is cold, it sends the air into the intake manifold without letting it pass through the throttle valve to increase the engine speed, and thus the engine is warmed up.

Operation

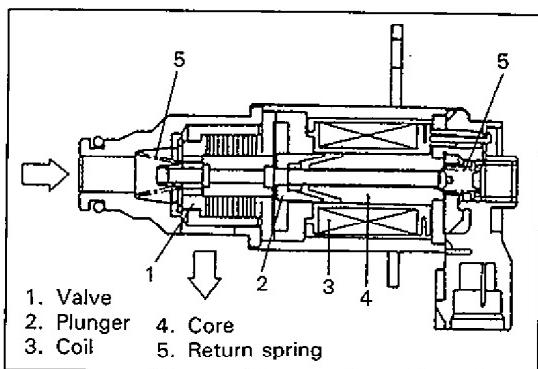
When the engine is cold (or engine cooling water is lower than about 70°C (158°F)), the thermo-wax contracts.

In this state, the valve opens by the spring force, allowing the air to be drawn into the intake manifold. Thus the amount of intake air increases even when the throttle valve is fully closed and the engine speed rises to the fast idle state which is higher than the normal idle speed.



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As the engine is warmed up, the thermo-wax expands gradually, then the piston pushes the valve gradually, and the amount of air passing through the air valve decreases and so does the engine speed. When the engine cooling water temperature reaches about 70°C (158°F), the valve is fully closed and the engine speed is back to the normal idle speed.



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ISC (Idle Speed Control) Solenoid Valve

The ISC solenoid valve controls opening of the bypass air passage (i.e., bypass air flow). The opening increases and decreases according to the electric current flow to the ISC solenoid which is controlled by ECM.

FUEL DELIVERY SYSTEM

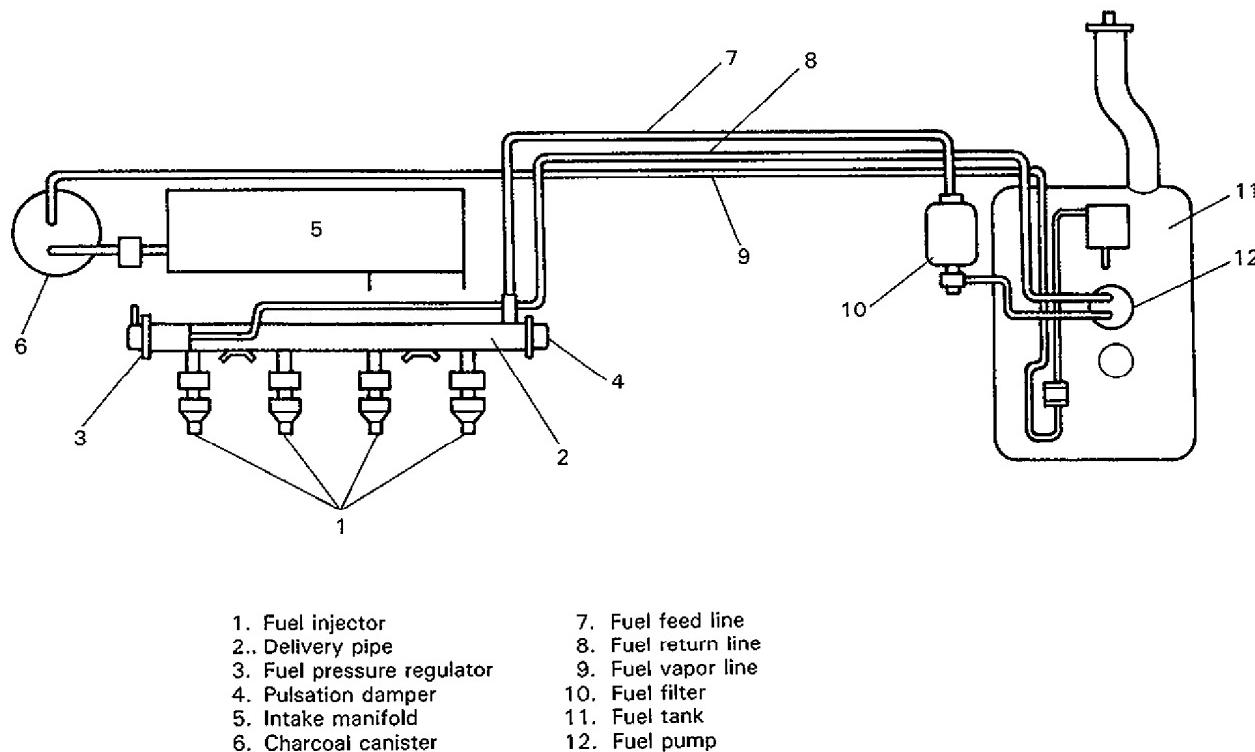
The fuel delivery system consists of the fuel tank, fuel pump, fuel filter, fuel pressure regulator, delivery pipe, fuel pulsation damper and fuel injectors.

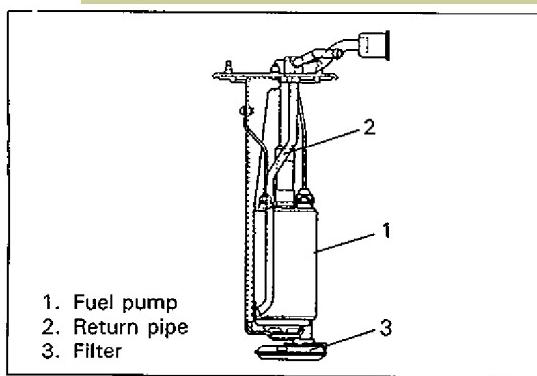
The fuel in the fuel tank is pumped up by the fuel pump, filtered by the fuel filter and fed under pressure to each injector through the delivery pipe. As the fuel pressure applied to the injector (the fuel pressure in the fuel feed line) is always kept a certain amount higher than the pressure in the

intake manifold by the fuel pressure regulator, the fuel is injected into the intake port of the cylinder head when the injector opens according to the injection signal from ECM.

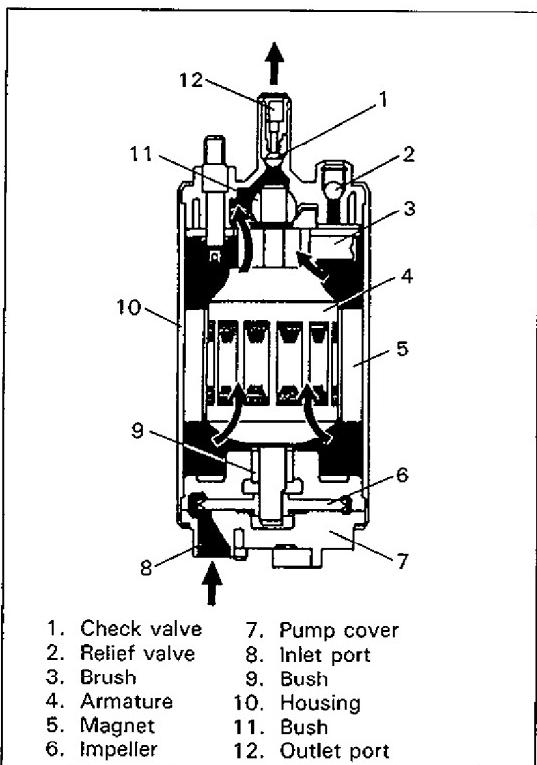
The fuel relieved by the fuel pressure regulator returns through the fuel return line to the fuel tank.

For the structure and operation of the fuel tank and filter, refer to SECTION 6C "ENGINE FUEL".

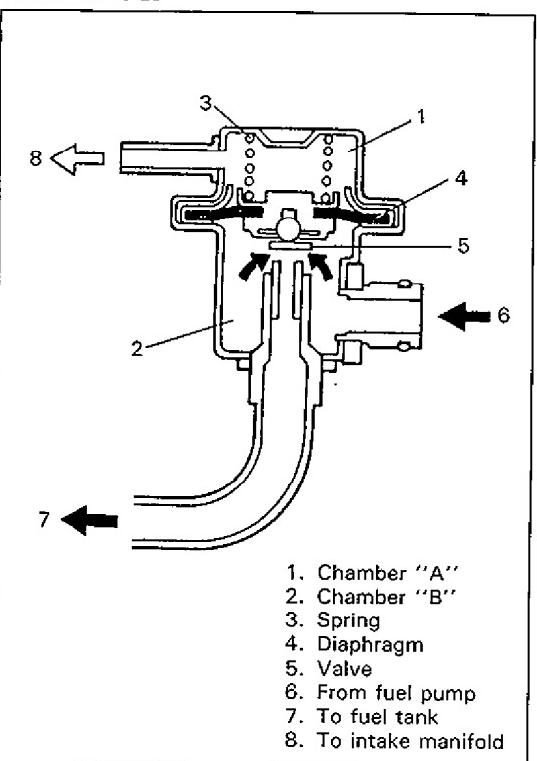




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FUEL PUMP

The electric fuel pump located in the fuel tank consists of armature, magnet, impeller, brush, check valve, etc.. The ECM controls its ON/OFF operation as described under "Fuel Pump Control System" included in later part of this section.

Operation

When power is supplied to the fuel pump, the motor in the pump runs and so does the impeller.

This causes a pressure difference to occur between both sides of the impeller as there are many grooves around it. Then the fuel is drawn through the inlet port, and with its pressure increased it is discharged through the outlet port.

The fuel pump also has a relief valve to prevent excessive rise of the discharge pressure and a check valve to keep some pressure in the fuel feed line even when the fuel pump is stopped.

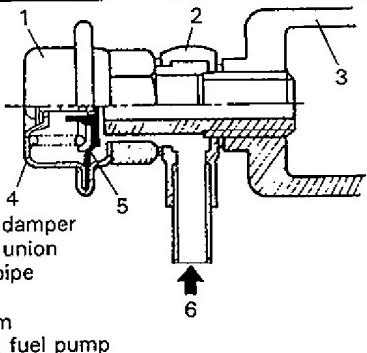
FUEL PRESSURE REGULATOR

The fuel pressure regulator is diaphragm-operated relief valve consisting of diaphragm, spring and valve. It keeps the fuel pressure applied to the injector 2.9 kg/cm^2 (290 kPa, 41.2 psi) higher than that in the intake manifold at all times.

The pressure applied to the chamber "A" of fuel pressure regulator is intake manifold pressure and that to the chamber "B" is fuel pressure.

When the fuel pressure rises more than 2.9 kg/cm^2 (290 kPa, 41.2 psi) higher than the intake manifold pressure, the fuel pushes the valve in the regulator open and excess fuel returns to the fuel tank via the return line.

60A50-6E1-10-4S



60A50-6E1-11-1S

FUEL PULSATION DAMPER

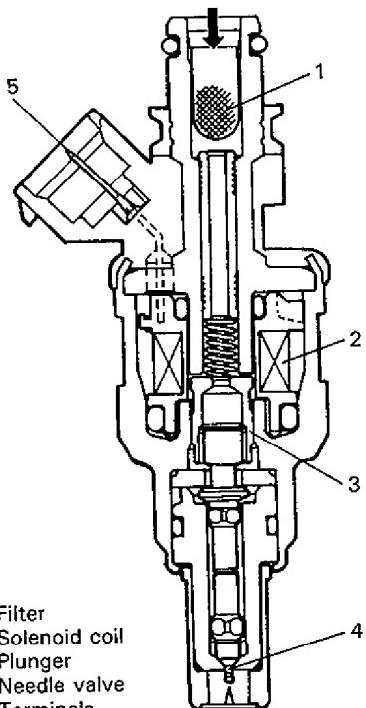
The fuel pulsation damper is installed to the delivery pipe. The fuel pressure applied to the injector is regulated to a certain level by the fuel pressure regulator, but as it is affected when the injector injects fuel, a slight change occurs in it. (pulsation) Then the fuel pulsation damper absorbs this pulsation.

FUEL INJECTOR

There are 4 injectors (one for each cylinder), each of which is installed between the intake manifold and delivery pipe. It is an electromagnetic type injection nozzle which injects fuel into the intake port of the cylinder head according to the signal from ECM.

Operation

When the solenoid coil of the injector is energized by ECM, it becomes an electromagnet and attracts the plunger. At the same time, the needle valve which is incorporated with the plunger opens and the injector which is under the fuel pressure injects fuel. As the lift stroke of the needle valve of the injector is set constant, the amount of fuel injected at one time is determined by the length of time during which the solenoid coil is energized (injection time).



60A50-6E1-11-2S

ELECTRONIC CONTROL SYSTEM

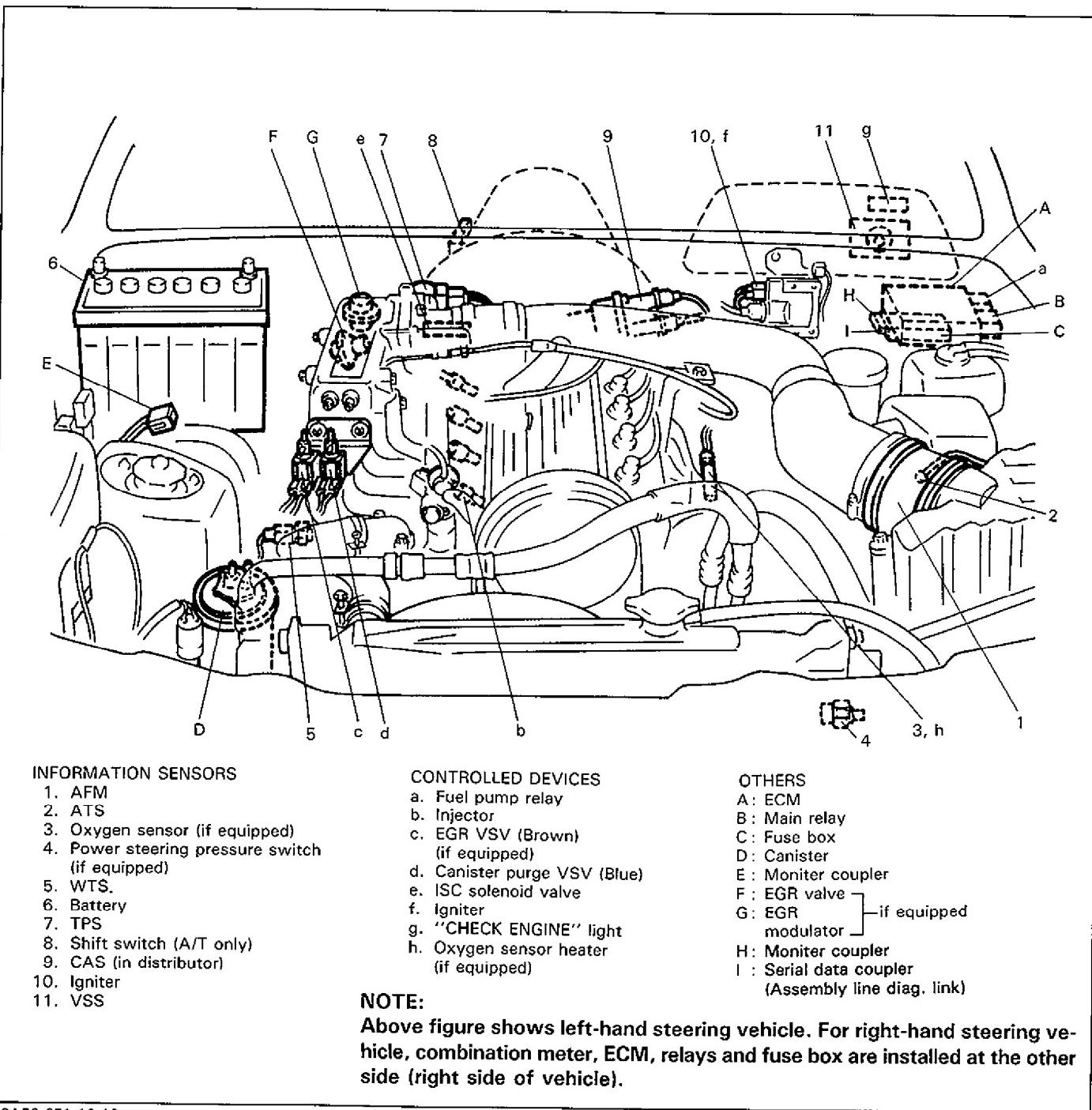
The electronic control system consists of 1) various sensors which detect the state of engine and driving conditions, 2) ECM which controls various devices according to the signals from the sensors and 3) various controlled devices.

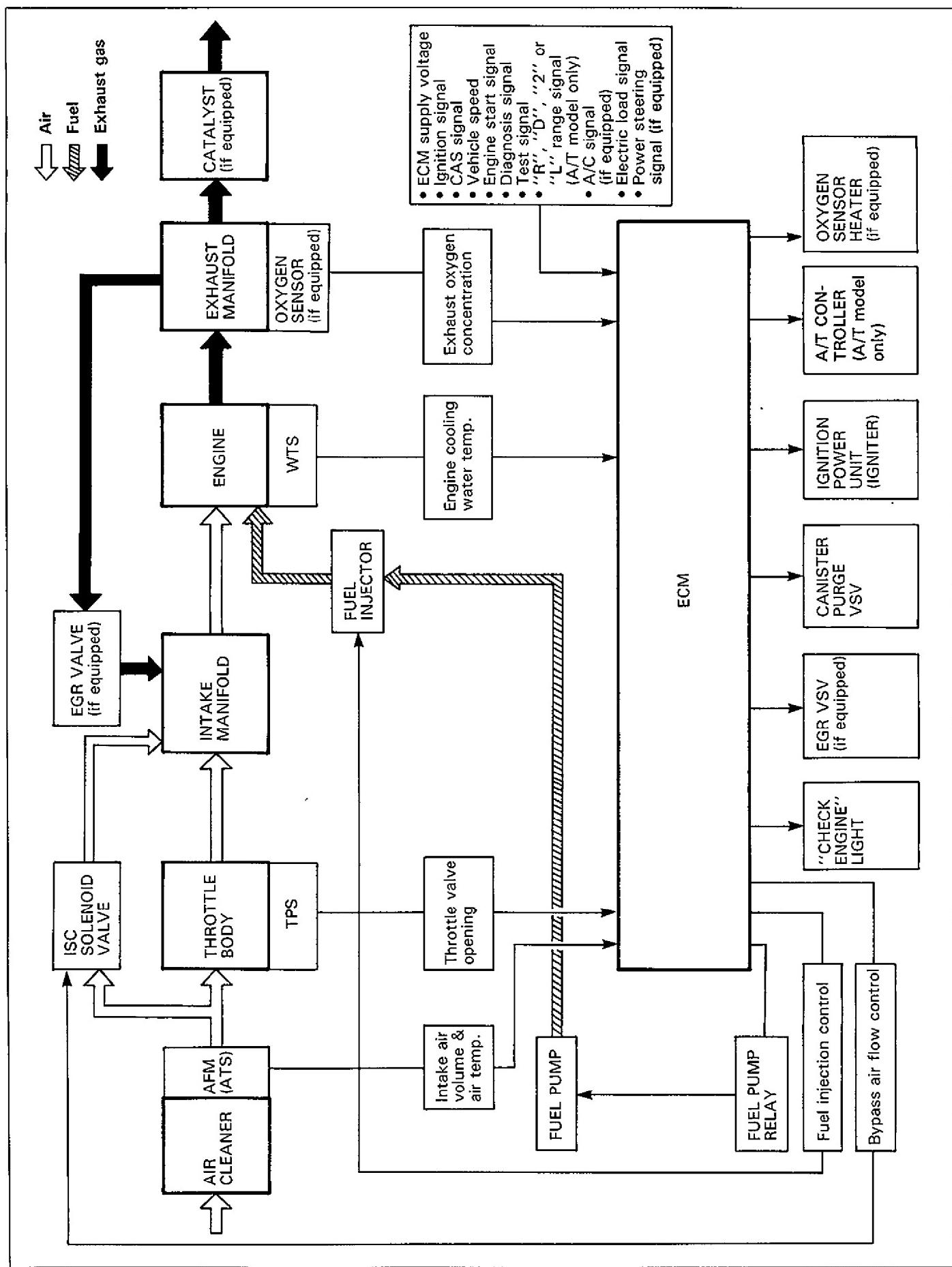
Functionally, it is divided into the following sub systems:

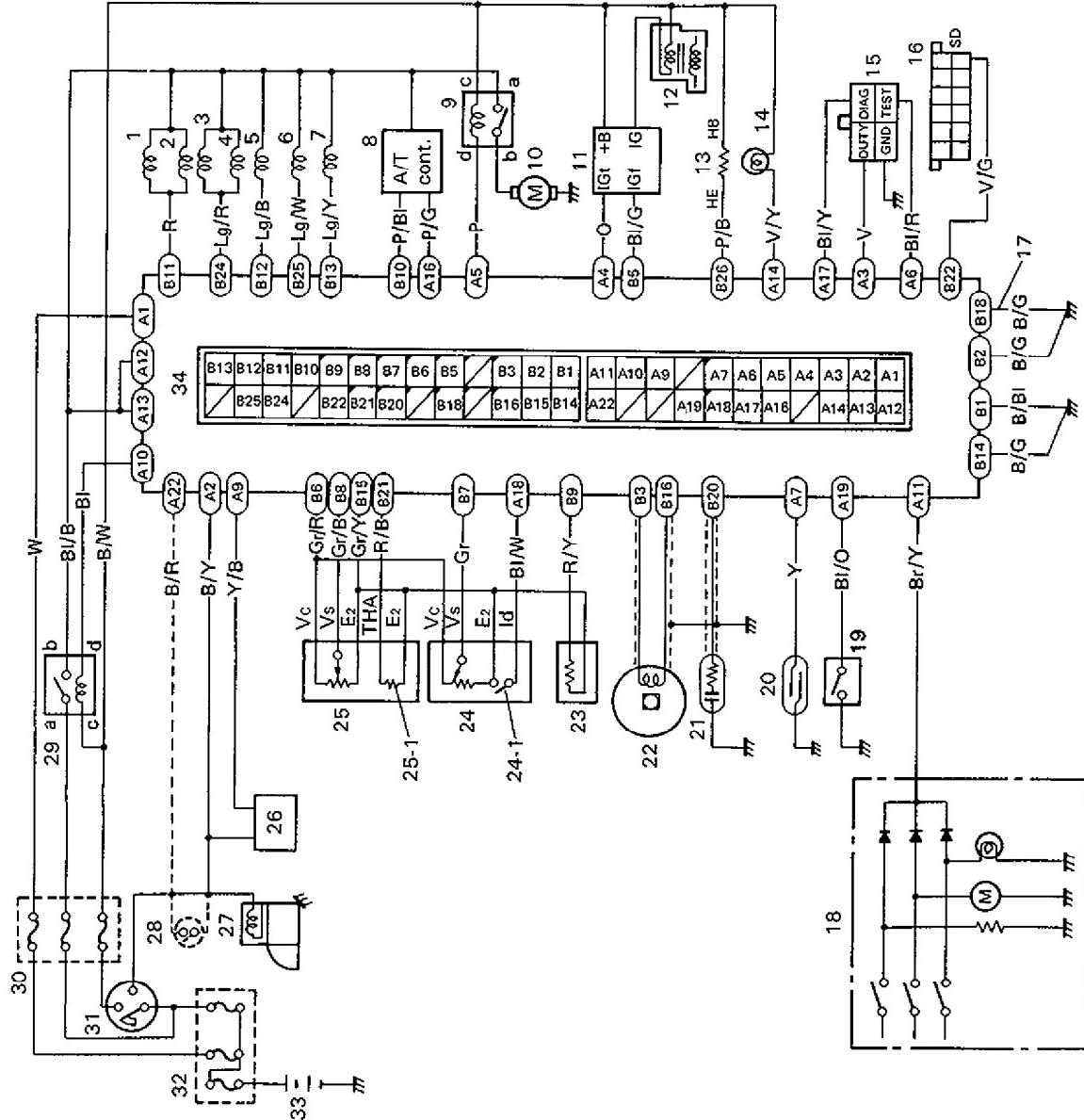
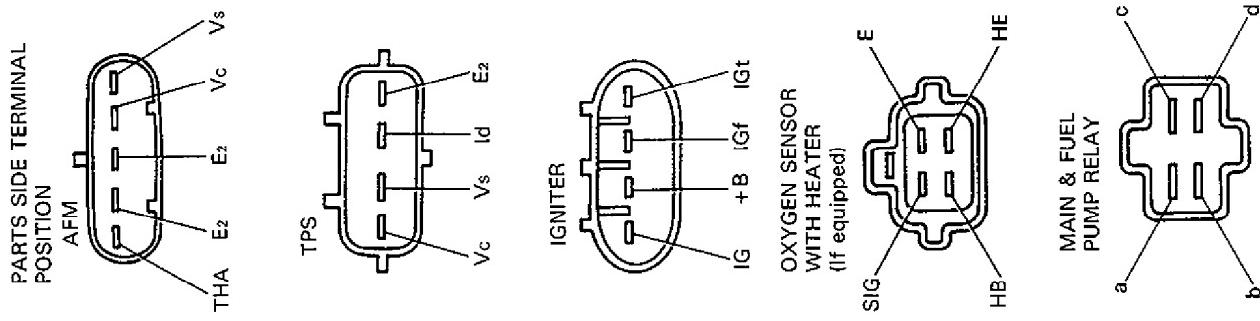
- Fuel injection control system
- Oxygen sensor heater control system (if equipped)

- ISC solenoid valve control system
- Fuel pump control system
- Evaporative emission control system
- ESA (Electronic Spark Advance) system
- EGR control system (if equipped)

Also, with A/T model, ECM sends throttle valve opening signal and cooling water temp. signal to A/T controller to control A/T.

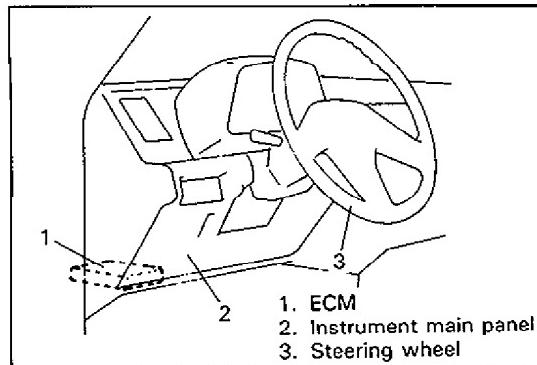




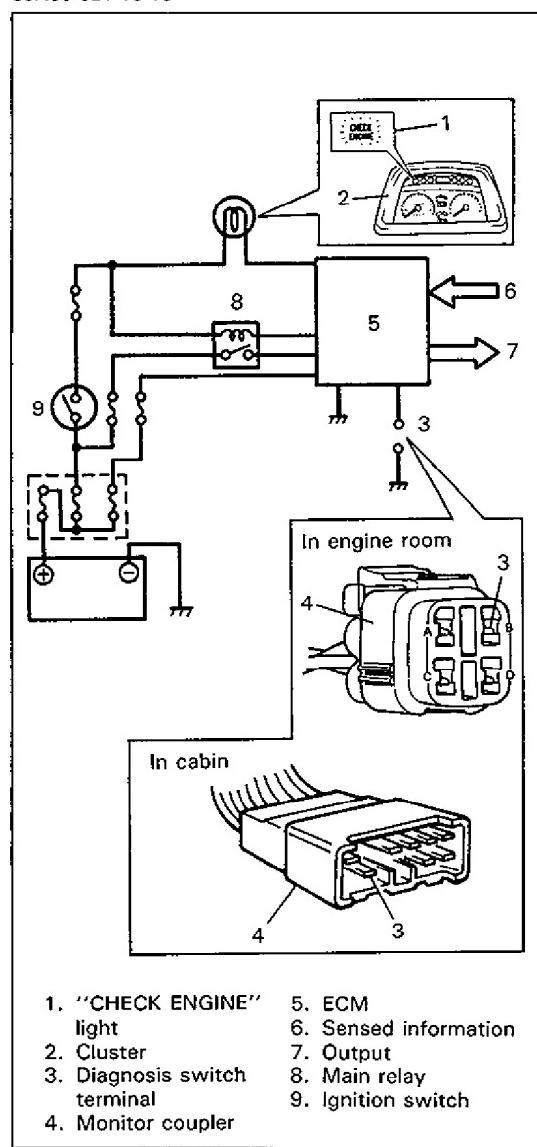


1. No. 1 injector
 2. No. 4 injector
 3. No. 2 injector
 4. No. 3 injector
 5. ISC solenoid valve
 6. Canister purge VSV
 7. EGR VSV
(if equipped)
 8. A/T controller
(A/T only)
 9. Fuel pump relay
 10. Fuel pump
 11. Igniter
 12. Ignition coil
 13. Oxygen sensor
heater (if equipped)
 14. "CHECK ENGINE"
light
 15. Monitor coupler
 16. Serial data coupler
 17. Ground (A/T only)
 18. Electric load
 19. Power steering
pressure switch
(if equipped)
 20. VSS
 21. Oxygen sensor
(if equipped)
 22. CAS
 23. WTS
 24. TPS
 - 24-1. Idle switch
 25. AFM
 - 25-1. ATS
 26. A/C amplifier
(if equipped)
 27. Starter magnetic
switch
 28. Shift switch
(A/T only)
 29. Main relay
 30. Circuit fuse
 31. Main switch
 32. Main fuse
 33. Battery
 34. ECM
- Wire color
- | | |
|-------|---------------------|
| B | : Black |
| B/G | : Black/Green |
| B/Bl | : Black/Blue |
| B/R | : Black/Red |
| B/Y | : Black/Yellow |
| Bl | : Blue |
| Bl/B | : Blue/Black |
| Bl/G | : Blue/Green |
| Bl/O | : Blue/Orange |
| Bl/R | : Blue/Red |
| Bl/W | : Blue/White |
| Bl/Y | : Blue/Yellow |
| Br | : Brown |
| Br/Y | : Brown/Yellow |
| Gr | : Gray |
| Gr/B | : Gray/Black |
| Gr/R | : Gray/Red |
| Gr/Y | : Gray/Yellow |
| Lg | : Lightgreen |
| Lg/B | : Lightgreen/Black |
| Lg/R | : Lightgreen/Red |
| Lg/Y | : Lightgreen/Yellow |
| Lg/W: | Lightgreen/White |
| O | : Orange |
| P | : Pink |
| P/B | : Pink/Black |
| P/Bl | : Pink/Blue |
| P/G | : Pink/Green |
| R | : Red |
| R/B | : Red/Black |
| R/Y | : Red/Yellow |
| Y | : Yellow |
| Y/B | : Yellow/Black |
| V | : Violet |
| V/G | : Violet/Green |
| V/Y | : Violet/Yellow |

TERMINAL	CIRCUIT	TERMINAL	CIRCUIT
A1	Power source	B3	CAS (positive)
A2	Engine start switch	B4	Blank
A3	Duty check terminal	B5	Igniter (IGf)
A4	Igniter (IGt)	B6	Power source (for sensor)
A5	Fuel pump relay	B7	TPS
A6	Test switch terminal	B8	AFM
A7	VSS	B9	WTS
A8	Blank	B10	A/T controller (throttle valve opening signal)
A9	A/C (if equipped)	B11	Injector (No. 1 & No. 4)
A10	Main relay	B12	ISC solenoid valve
A11	Electric load	B13	EGR VSV (if equipped)
A12	Power source	B14	Ground
A13	Power source	B15	Sensor ground
A14	"CHECK ENGINE" light	B16	CAS (negative)
A15	Blank	B17	Blank
A16	A/T controller (Water temp. signal)	B18	Ground (A/T only)
A17	Diag. switch terminal	B19	Blank
A18	Idle switch (in TPS)	B20	Oxygen sensor (if equipped)
A19	Power steering pressure switch (if equipped)	B21	ATS (in AFM)
A20	Blank	B22	Serial data terminal
A21	Blank	B23	Blank
A22	Shift switch	B24	Injector (No. 2 & No. 3)
B1	Ground	B25	Canister purge VSV
B2	Ground	B26	Oxygen sensor heater (if equipped)



60A50-6E1-16-1S



60A50-6E1-16-2S

Electronic Control Module (ECM)

ECM is installed to the underside of the instrument panel at the driver's seat side.

ECM is a precision unit consisting of microcomputer, A/D (Analog/Digital) converter, I/O (Input/Output) unit, etc..

It is an essential part of the electronic control system, for its functions include not only such a major function as to control fuel injector, ISC solenoid valve, fuel pump relay, etc. but also self-diagnosis function and fail-safe function as described in the following section.

Self-diagnosis function

ECM diagnoses troubles which may occur in the areas including the following parts when the ignition switch is ON or the engine is running, and indicates the result by turning on or flashing "CHECK ENGINE" light.

- Oxygen sensor
- Water temp. sensor
- Throttle position sensor
- Air temp. sensor
- Vehicle speed sensor
- Air flow meter
- Ignition fail-safe signal
- Crank angle sensor
- CPU (Central Processing Unit) of ECM

ECM and "CHECK ENGINE" light operate as follows.

- "CHECK ENGINE" light lights when the ignition switch is turned ON (but the engine at stop) with the diagnosis switch terminal ungrounded regardless of the condition of Electronic Fuel Injection system. This is only to check the "CHECK ENGINE" light bulb and its circuit.
- If the above areas of Electronic Fuel Injection system is free from any trouble after the engine start (while engine is running), "CHECK ENGINE" light turns OFF.

- When ECM detects a trouble which has occurred in the above areas, it makes "CHECK ENGINE" light turn ON while the engine is running to warn the driver of such occurrence of trouble and at the same time it stores the exact trouble area in ECM back-up memory.

(The memory is kept as it is even if the trouble was only temporary and disappeared immediately. And it is not erased unless the power to ECM is shut off for 20 seconds or longer.)

ECM also indicates trouble area in memory by means of flashing of "CHECK ENGINE" light at the time of inspection (i.e. when diagnosis switch terminal is grounded and ignition switch is turned ON).

NOTE:

Only ignition circuit trouble (code No. 41) among the above areas is not stored in back-up memory of ECM. (In other words, even if ECM has detected a trouble in ignition circuit, once ignition switch is turned OFF, code No. 41 will not be indicated even when diagnosis switch terminal is grounded and ignition switch is turned ON).

Therefore, to check diagnostic code when engine fails to start, crank engine and then ground diagnostic switch terminal with ignition switch ON.

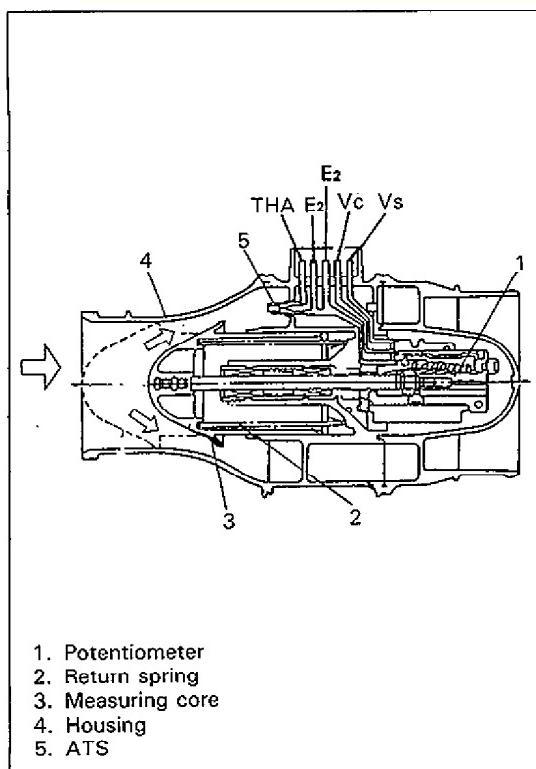
60A50-6E1-17-1S

Fail-safe function

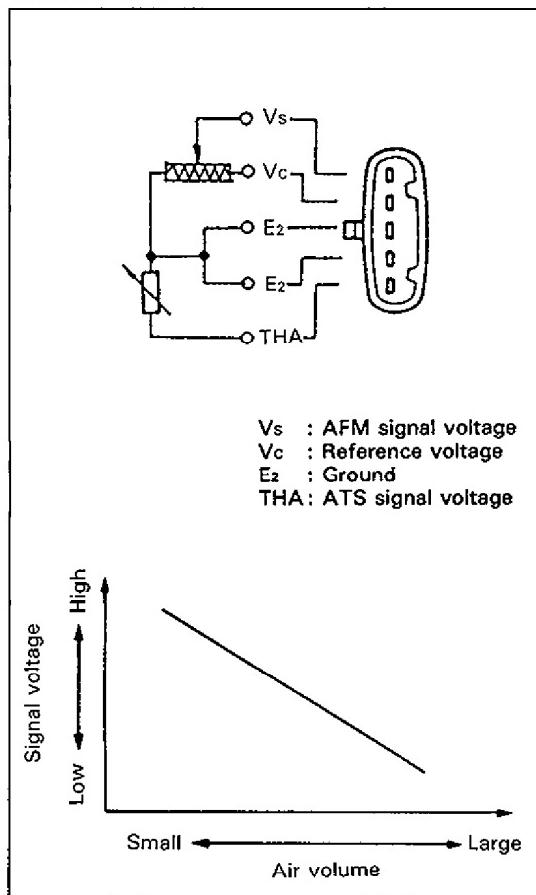
Even when a trouble has occurred in such areas of Electronic Fuel Injection system that include the following parts and a failure signal is sent to ECM, control over the injector, ISC solenoid valve and other is maintained on the basis of the standard signals and/or back-up program prestored in the ECM while ignoring that failure signal and/or CPU. This function is called "fail-safe function". Thus, with this function, a certain level of engine performance is available even when some failure occurs in such areas so that disability in running is avoided.

- Water temp. sensor
- Throttle position sensor
- Air temp. sensor
- Air flow meter
- CPU in ECM

60A50-6E1-17-2S



60A50-6E1-18-1S



60A50-6E1-18-3S

Air Flow Meter (AFM)

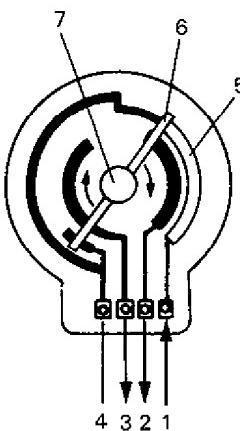
The AFM consisting of measuring core, return spring, potentiometer, housing etc. is installed between air cleaner and intake manifold.

It detects the amount of air drawn into the engine and sends that information to ECM as a voltage signal. ECM uses the signal as one of the signals to control various devices.

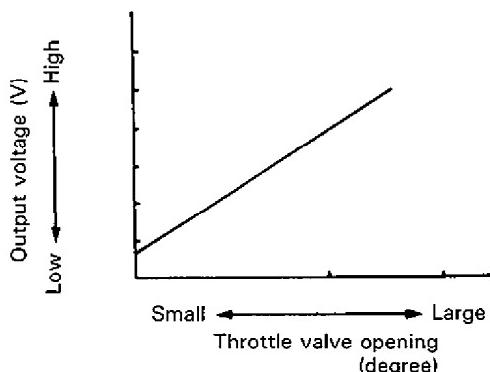
The measuring core moves in the thrust direction to a position where it is balanced with the intake air pressure according to the amount of intake air.

That position, or the amount of intake air, is detected by the potentiometer which is interlocked with the measuring core.

A 5-volt reference voltage is applied to the meter from ECM and as its brush moves over the print resistance according to the intake air volume, the signal voltage varies accordingly.



1. Reference voltage
2. Output voltage
3. ON/OFF signal
4. Ground
5. Resistance
6. Brush
7. Rotor



60A50-6E1-19-1S

Throttle Position Sensor (TPS)

The throttle position sensor consisting of a contact point (idle switch) and a potentiometer is installed on the throttle body, and detects the throttle valve opening.

The throttle opening in the idle state is detected by means of the contact point which turns ON in that state.

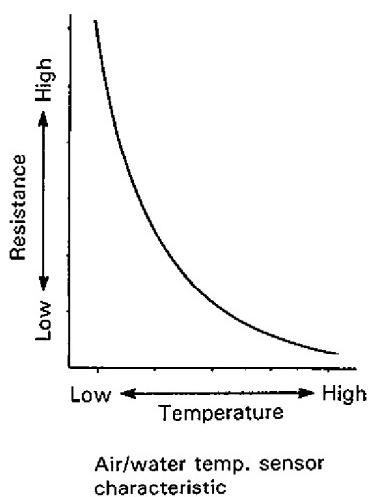
But beyond that, the full opening is detected by the potentiometer as follows.

A 5-volt reference voltage is applied to the sensor from ECM and as its brush moves over the print resistance according to the throttle valve opening, the output voltage varies accordingly.

By monitoring the ON/OFF signal and sensor output voltage, ECM detects the throttle valve opening.

ECM uses the signal from TPS as one of the signals to control fuel injector, ISC solenoid valve, ignition timing, canister purge VSV and EGR VSV (if equipped).

Also, ECM converts the voltage signal from TPS into ON/OFF signal and sends it to A/T controller, where it is used as one of the signals to control the automatic transmission.



Air/water temp. sensor characteristic

Air Temperature Sensor (ATS)

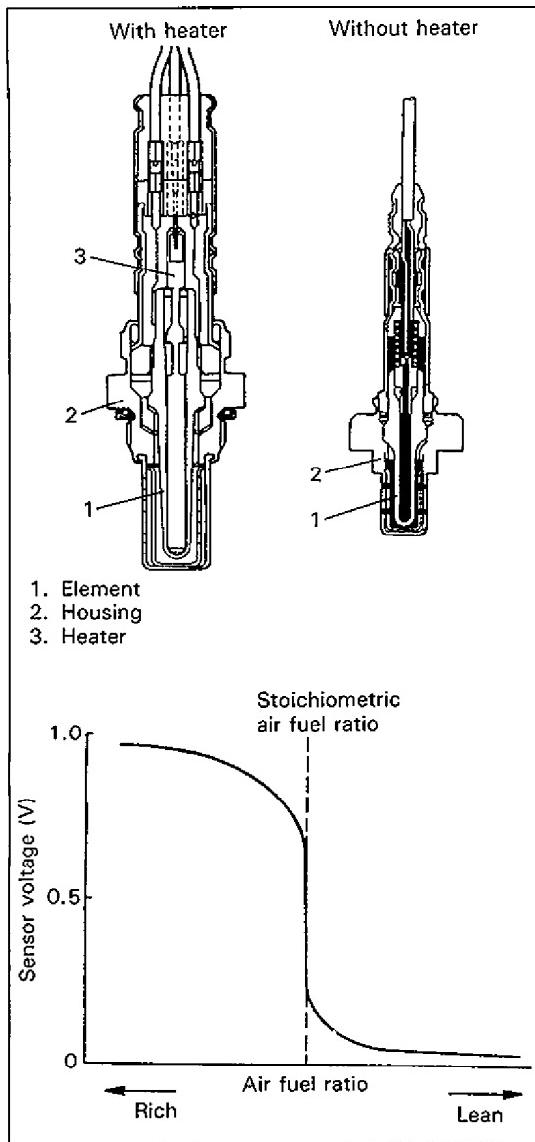
Located in the AFM, this sensor constantly measures the temperature of the air entering there and converts a change in the air temperature into that in resistance through its thermister. As air density of the intake air varies with variation in temperature, ECM, by monitoring the resistance, adjusts the amount of fuel injection according to the air temperature.

Water Temperature Sensor (WTS)

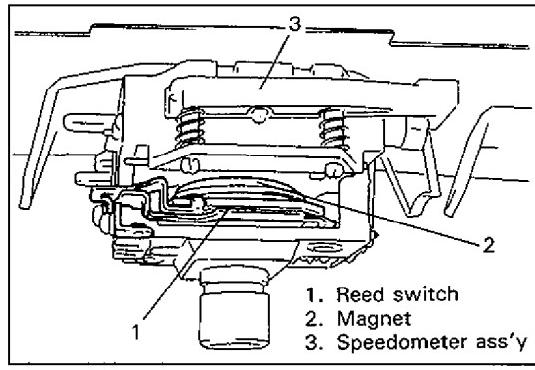
Located at the side of intake manifold, this sensor measures the temperature of the engine cooling water and converts its change into that in resistance through the thermister like the ATS.

By monitoring the resistance of the water temperature sensor, ECM detects the engine cooling water temperature and that affects most systems under the control of ECM.

60A50-6E1-19-4S



60A50-6E1-20-1S



60A50-6E1-20-4S

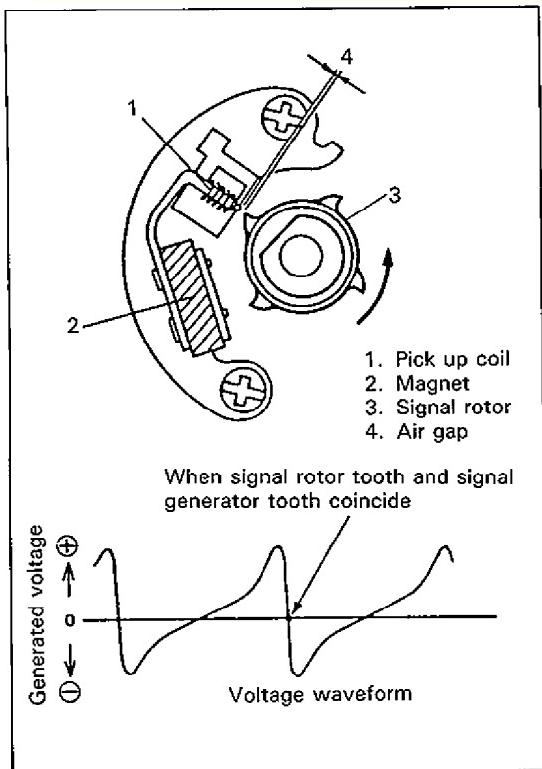
Oxygen Sensor (if equipped)

The oxygen sensor is installed on the exhaust manifold to detect the concentration of oxygen in the exhaust gases. The oxygen sensor heater, if equipped, promotes activation of the oxygen sensor.

Vehicle Speed Sensor (VSS)

The speed sensor consisting of the reed switch and magnet is built in the speedometer. As the magnet turns with the speedometer cable, its magnetic force causes the reed switch to turn ON and OFF. Such ON/OFF frequency increases or decreases in proportion with the vehicle speed and is sent to ECM as pulse signals.

ECM uses it as one of the signals to control the ISC solenoid valve.



Crank Angle Sensor (CAS)

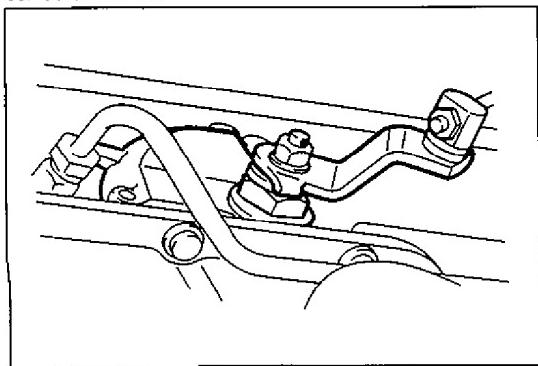
The crank angle sensor located in the distributor consists of the signal generator (pick-up coil and magnet) and signal rotor. As the signal rotor turns, AC voltage is generated in the pick-up coil which varies in pulsatory way as shown in figure. This pulse signal (4 pulses/revolution) is sent to ECM where it is used to calculate the engine speed and also as one of the signals to control varius devices.

60A50-6E1-21-3S

Engine Start Signal

This signal is sent from the engine starter circuit. Receiving it, ECM judges whether the engine is cranking or not and uses it as one of the signals to control the fuel injector and fuel pump relay.

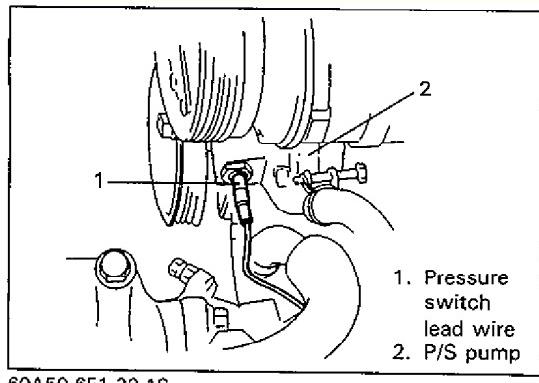
60A50-6E1-21-4S



Shift Switch (A/T only) ("R", "D", "2" or "L" range signal)

Located on the transmission, it turns ON when the select lever is in the park or neutral position. ECM detects whether the transmission is in the parking or neutral state or in any other state through this ON/OFF signal and uses it as one of the signals to control fuel injectors and ISC solenoid valve.

60A50-6E1-21-5S



60A50-6E1-22-1S

Power Steering Signal (For vehicle with power steering)

This signal is sent from the power steering pressure switch. The power steering pressure switch is installed on the power steering pump body.

The switch turns ON when the oil pressure is higher than 15–20 kg/cm² (215–285 psi).

The turning of the steering wheel causes increased oil pressure.

ECM uses it as one of the signals for controlling ISC solenoid valve operation.

Air-Conditioner Signal (For vehicle with A/C)

This signal is sent from the air-conditioner circuit.

ECM detects whether the air-conditioner is operating or not through the signal and uses it as one of the signals for controlling ISC solenoid valve operation.

60A50-6E1-22-2S

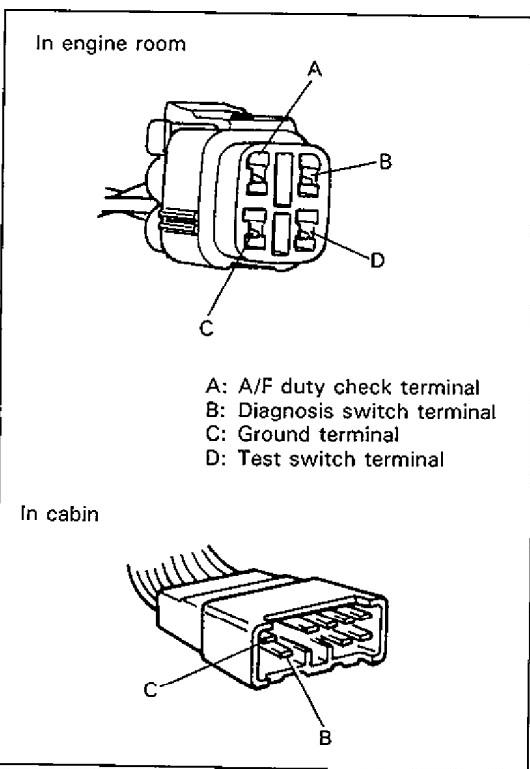
Battery Voltage

The fuel injector is driven by its solenoid coil based upon the ECM output signal.

There is some delay called as "Ineffective injection time", which doesn't provide fuel, between ECM signal and valve action.

As the ineffective injection time depends on the battery voltage, ECM takes voltage information to compensate it in fuel injection time.

60A50-6E1-22-3S



Diagnosis Switch Terminal

There are two diagnosis switch terminals; one included in the monitor coupler in the cabin and the other in the monitor coupler in the engine room. When either diagnosis switch terminal is grounded, a diagnosis signal is fed to ECM which then outputs self-diagnosis code and at the same time outputs ISC duty through duty check terminal.

Test Switch Terminal

The test switch terminal is included in the engine-room monitor coupler. When this terminal is grounded, ECM sets the ignition timing to the initial ignition timing.

When both test switch terminal and diagnosis switch terminal are grounded, ECM outputs A/F duty through the duty check terminal.

60A50-6E1-22-4S

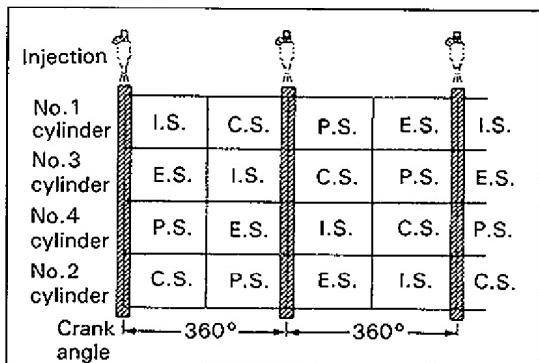
FUEL INJECTION CONTROL SYSTEM

In this system, ECM controls the time (amount) and timing of the fuel injection from the fuel injector into the cylinder head intake port according to the signals from the various sensors so that suitable air/fuel mixture is supplied to the engine in each driving condition.

Injection Timing

There are two types of injection timing. One is "synchronous injection" in which injection is synchronous with the CAS signal and the other is "asynchronous injection" in which injection takes place independently of the CAS signal.

60A50-6E1-23-1S



I.S. Intake stroke

E.S. Exhaust stroke

P.S. Power stroke

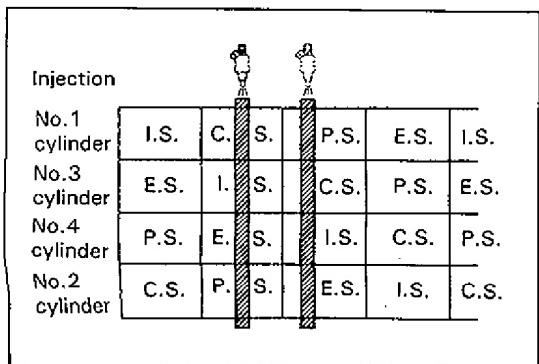
C.S. Compression stroke

60A50-6E1-23-3S

Synchronous injection

Usually, all four injectors inject fuel simultaneously and synchronously at every two CAS signals, that is, once every crankshaft turn.

When the engine is started from its cold state, however, the amount of fuel determined by the engine cooling water temperature is divided and injected.



Asynchronous injection

In one of the following conditions, simultaneous fuel injection occurs at four injectors once regardless of CAS signals in addition to the above synchronous injection.

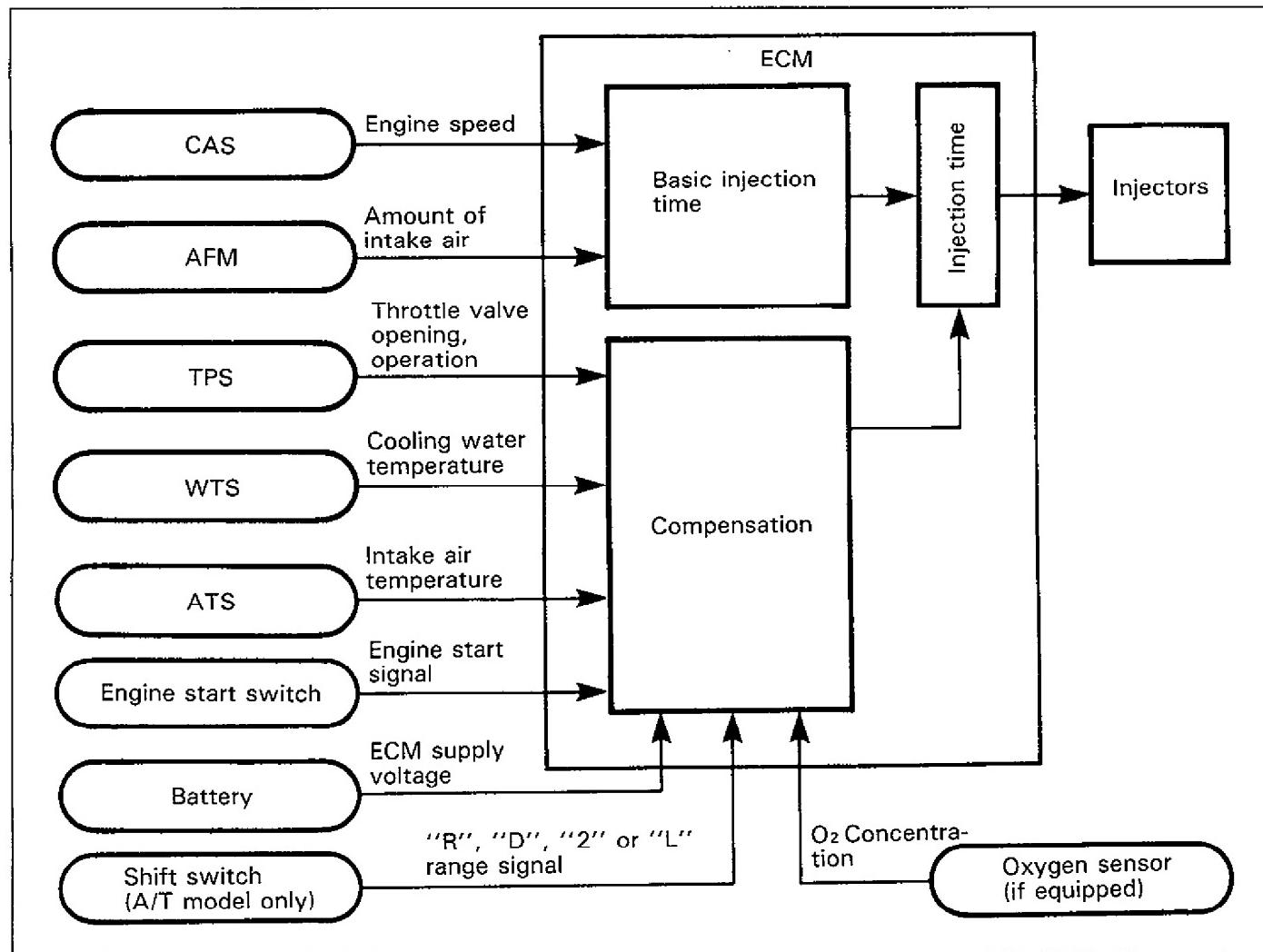
- When the idle switch turns OFF from ON.
- When a change in throttle valve opening exceeds its specified value.
- When decelerating while the engine speed is low (M/T only)

60A50-6E1-23-5S

Injection time (amount of injection)

The factors to determine the injection time are the basic injection time which is calculated on the basis of the engine speed and the amount of the intake air and various compensations which are

determined according to the signals from various sensors that detect the state of the engine and driving conditions.



60A50-6E1-24-1S

Intake air temperature compensation

As the intake air volume varies with the temperature, it is compensated for its temperature.

Enriching compensation while engine starting

In order to improve starting performance, enriching compensation at start is carried out.

Enriching compensation after engine start

For a certain time after the engine is started, air/fuel mixture enriching compensation is made so as to stabilize the engine speed. The amount of compensation varies depending on the engine cooling water temperature and it is the largest immediately after the engine start and after that, it reduces gradually.

Enriching compensation while warming up

When the engine is cold, enriching compensation is made to ensure good driveability till the engine cooling water temperature reaches the specified level. The amount to enrich the air/fuel mixture is decreased as the temperature rises.

Power enriching compensation

To ensure smooth acceleration and good driveability under the high load driving condition, enriching compensation is carried out when the throttle valve opening is larger than specification.

60A50-6E1-24-2S

Enriching compensation when accelerating

When the accelerator pedal is depressed, the enriching compensation takes place to obtain smooth acceleration performance. The amount of increase for compensation depends on the engine cooling water temperature.

Enriching compensation when shifting to "R", "D", "2" or "L" range (For A/T model)

To stabilize the engine speed when the temperature is very low, enriching compensation is carried out when the selector lever is shifted from "P" or "N" range to "R", "D", "2" or "L" range.

Battery voltage compensation

A power voltage drop delays the mechanical operation of the injector. Then the actual injection time becomes shorter for the time that electricity is supplied to the injector. To compensate this, the electricity supply time is made longer when the voltage is lower.

Base air/fuel ratio compensation (oxygen sensor equipped vehicle only)

The air/fuel ratio may vary due to such factors as variation in each engine itself and aging. To compensate such variation, feed back compensation is used and base air/fuel mixture ratio is adjusted to a proper level for feed back compensation.

Fuel cut

Fuel injection stops (with operation of the injector prevented) when decelerating, so that unburned gas will not be exhausted and it starts again when above conditions for fuel recovery are fulfilled.

the fuel injection also stops when the engine speed exceeds 6,720 r/min to prevent over-run which affects the engine adversely and it starts again when the engine speed reduces to less than 6,680 r/min.

Air/fuel ratio feed back compensation (Oxygen sensor equipped vehicle only)

It is necessary to keep the air/fuel mixture close to the theoretical air/fuel ratio (14.7) to obtain efficient performance of the 3-way catalyst and high clarification rate of CO, HC and NOx in the exhaust gas. For that purpose, ECM operates as follows. It first compares the signal from the oxygen sensor with a specified reference voltage and if the signal is higher, it detects that the air/fuel ratio is richer than the theoretical air/fuel ratio and reduces fuel. On the other hand, if the signal is lower, it detects that the air/fuel ratio is leaner and increases fuel. By repeating these operations, it adjusts the air/fuel ratio closer to the theoretical air/fuel ratio.

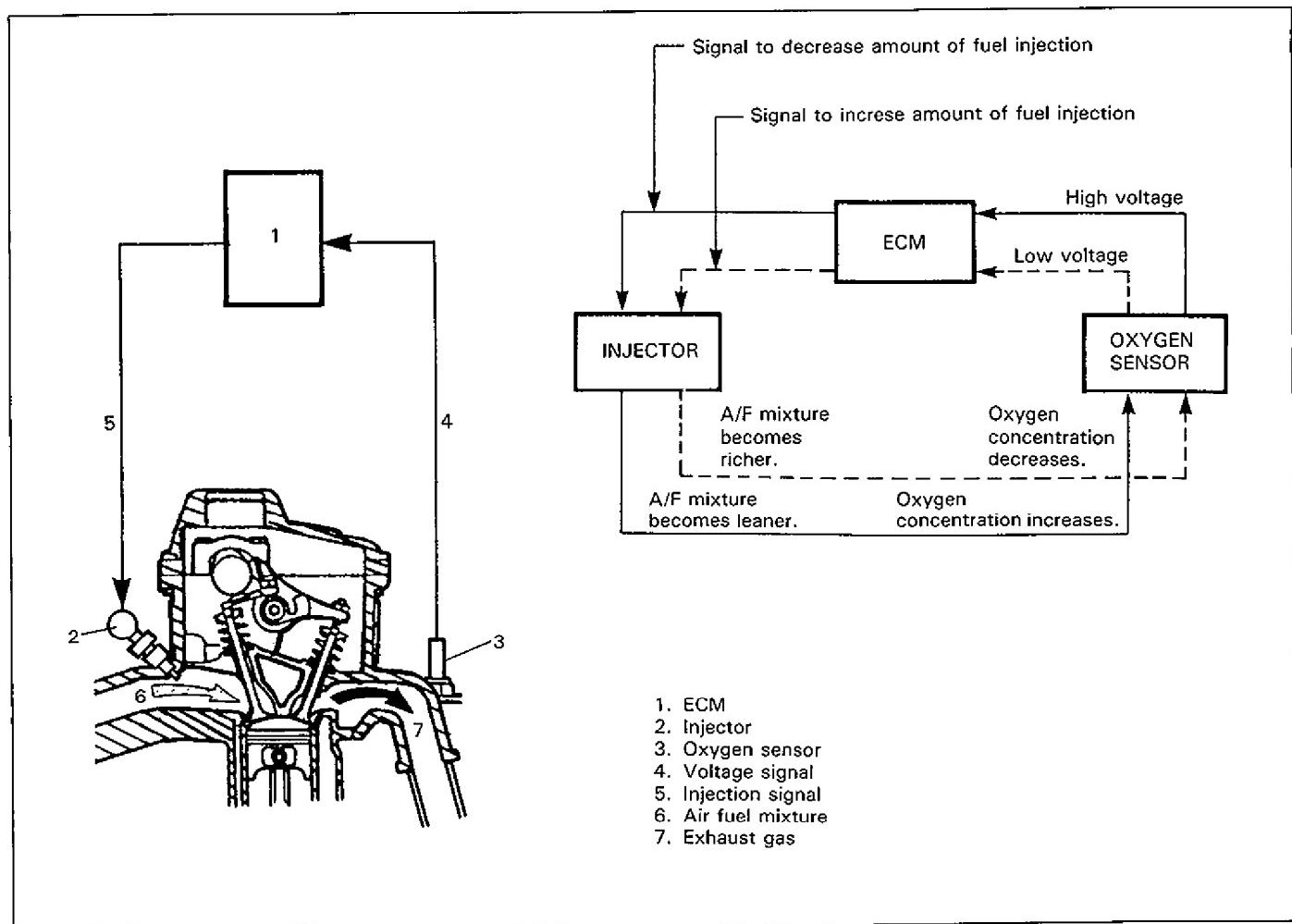
- When oxygen concentration in the exhaust gas is low, that is, when the air/fuel ratio is smaller

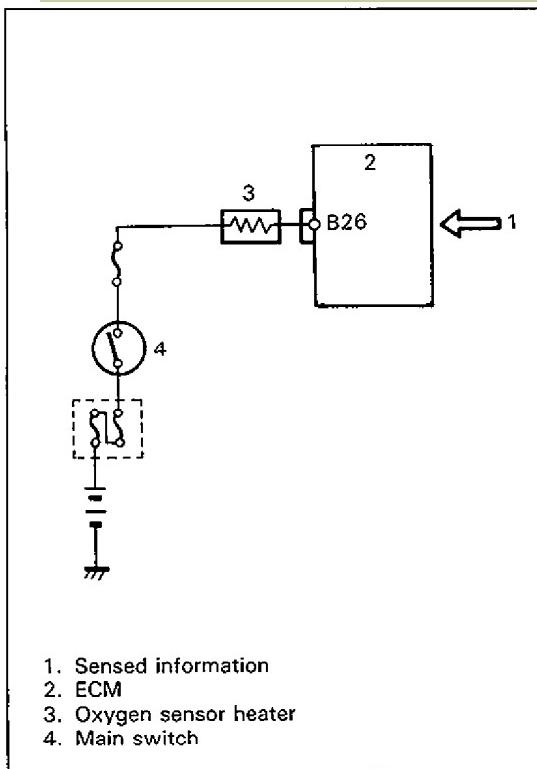
than the theoretical air/fuel ratio (fuel is richer), electromotive force of the oxygen sensor increases and a rich signal is sent to ECM.

- Upon receipt of the rich signal, ECM decreases the amount of fuel injection, which causes oxygen concentration in the exhaust gas to increase and electromotive force of the oxygen sensor to decrease. Then a lean signal is sent to ECM.
- As ECM increases the amount of fuel injection according to the lean signal, oxygen concentration in the exhaust gas decreases and the situation is back to above 1).

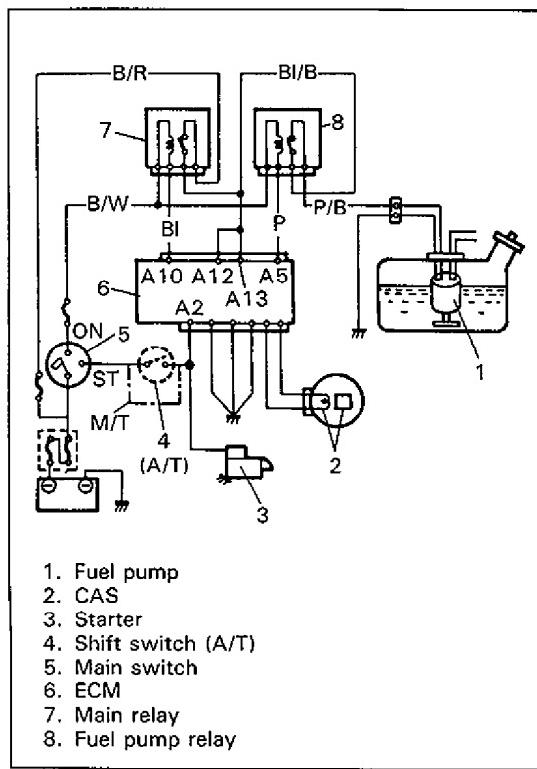
This control process, however, will not take place under any of the following conditions.

- When engine cooling water temperature is low
- At fuel cut
- When oxygen sensor is cold





60A50-6E1-27-1S



60A50-6E1-27-3S

OXYGEN SENSOR HEATER CONTROL SYSTEM (IF EQUIPPED)

This system controls operation (ON/OFF) of the heater which assists activation of the oxygen sensor. ECM turns the oxygen sensor heater ON (to allow the electric current to flow to the oxygen sensor heater) when the following conditions is satisfied.

- The engine is running without high-load and high-speed condition.

FUEL PUMP CONTROL SYSTEM

ECM controls ON/OFF operation of the fuel pump by turning it ON via the fuel pump relay under one of the following conditions.

- For 2 seconds after ignition switch ON.
- While engine start signal is inputted to ECM.
- While CAS signal is inputted to ECM.

ISC SOLENOID VALVE CONTROL SYSTEM

This system controls the bypass air flow by means of ECM and ISC solenoid valve for the following four purposes.

- To keep the engine idle speed as specified at all times.

The engine idle speed can vary due to following reasons.

- * Load applied to engine (when electric load is applied, automatic transmission is shifted to "R", "D", "2" or "L" range, air-conditioner is turned ON, etc.)
- * Variation in atmospheric pressure
- * Change in engine itself with passage of time
- * Other factors causing idle speed to change
- To improve starting performance of engine
- To compensate air/fuel mixture ratio when decelerating (Dash-pot effect)
- To improve driveability when while engine is warmed up.

Operation

ISC solenoid valve opens the bypass air passage when it is turned ON by ECM and closes it when turned OFF.

ECM detects the engine condition by using signals from various sensors and switches and while repeating ON and OFF cycle of ISC solenoid valve at a certain rate (500 times a second), it controls bypass air flow (ISC solenoid valve opening) by increasing and decreasing its ON time within a cycle.

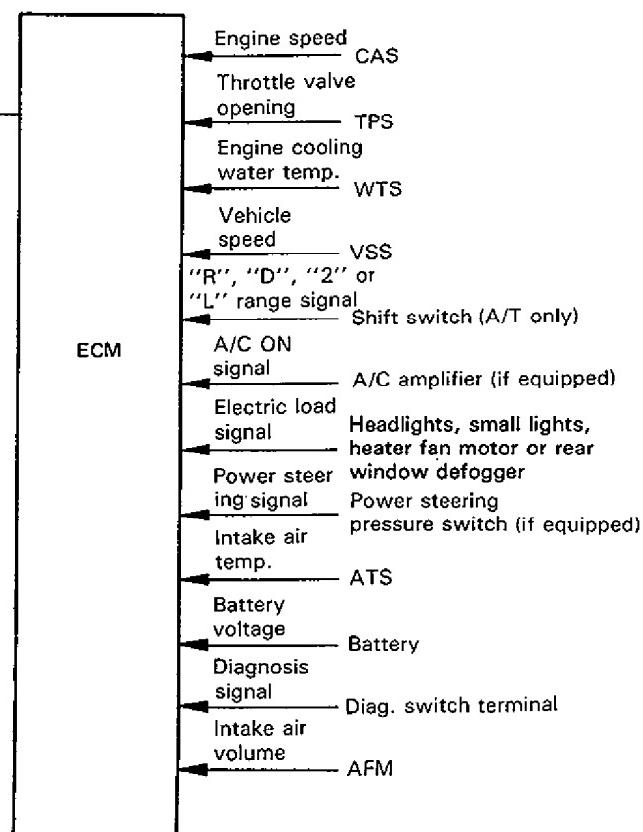
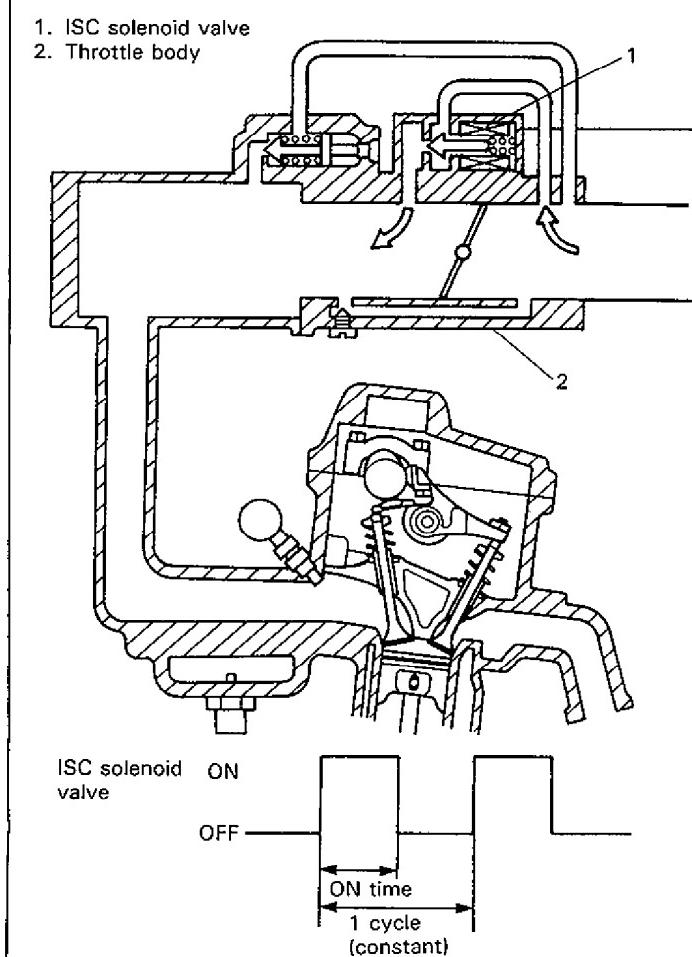
When the vehicle is at a stop, the throttle valve is at the idle position and the engine is running, the engine speed is kept at a specified idle speed.

M/T vehicle

	A/C OFF	A/C ON
Engine idle speed specification	800±50 r/min.	900±50 r/min.

A/T vehicle

	A/C OFF	A/C ON
Engine idle speed specification	"P" or "N" range 800±50 r/min.	950±50 r/min.
	"R", "D", "2" or "L" range 750±50 r/min.	800±50 r/min.



EXHAUST GAS RECIRCULATION (EGR) CONTROL SYSTEM (IF EQUIPPED)

This system controls the formation of NOx emission by recirculating the exhaust gas into the combustion chamber through the intake manifold.

The EGR valve is controlled by EGR modulator and VSV controlled by ECM according to signals from various sensors.

The diaphragm mounted in the EGR modulator is operated by back pressure of the exhaust gas to open and close the valve. By this opening and closing action of the valve, the EGR modulator controls the vacuum transmitted to the EGR valve.

Under a low load condition such as low speed driving, the exhaust pressure is low. In this state, the diaphragm in the EGR modulator is pushed down by the spring force and the modulator valve opens to allow the air into the vacuum passage from the outside.

As a result, the vacuum transmitted to the EGR valve becomes smaller and so does the opening of the EGR valve.

Thus, less amount of exhaust gas is recirculated to the intake manifold.

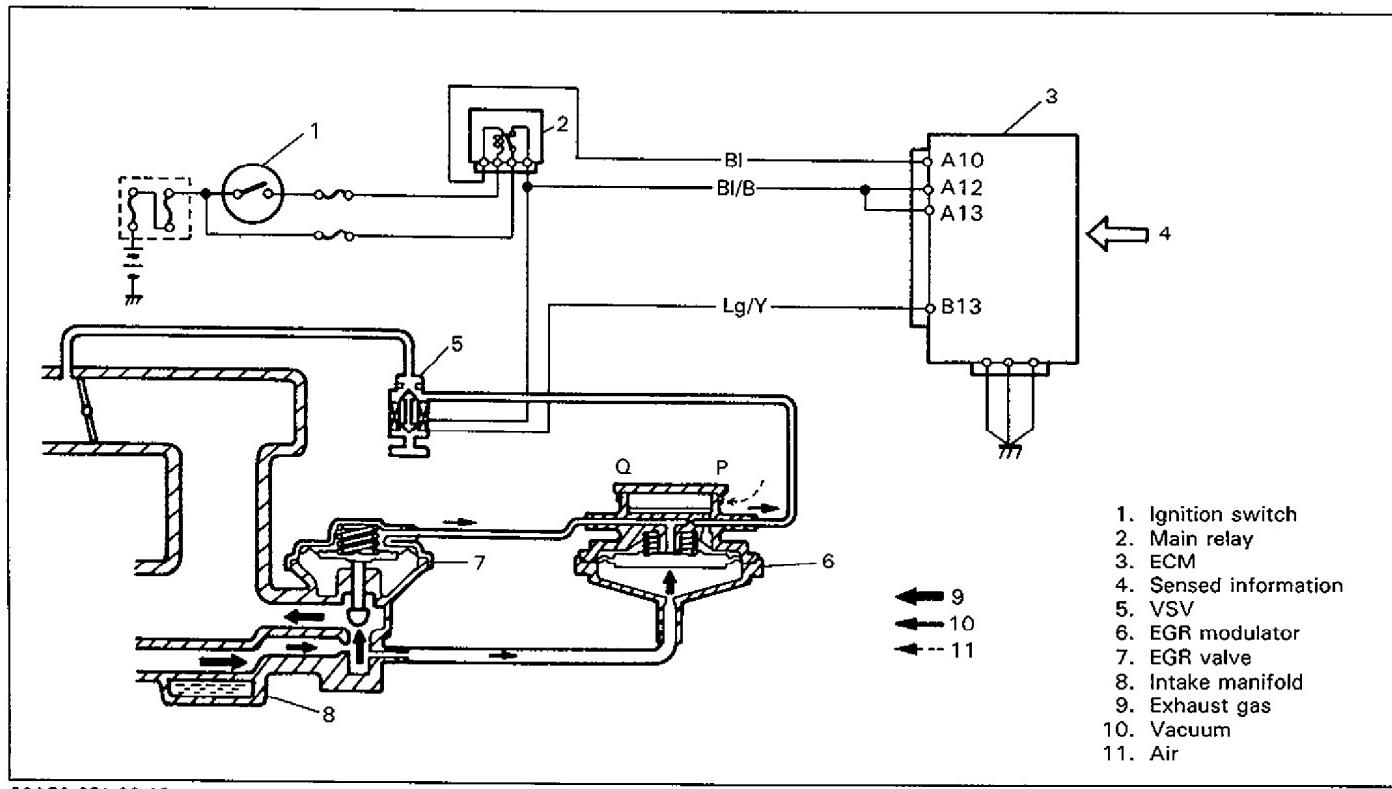
Under a high load condition such as high speed driving, on the other hand, the exhaust pressure is high. By the high exhaust pressure, the diaphragm in the modulator is pushed up and closes its valve. As the air does not enter the vacuum passage in this state, the vacuum transmitted to the EGR valve grows larger and so does the opening of the EGR valve.

Thus, larger amount of exhaust gas is recirculated to the intake manifold.

When following conditions either 1) through 3) or 1) and 4) are satisfied, ECM opens vacuum passage of VSV. ECM opens and closes in accordance with the EGR modulator operation.

- 1) When engine cooling water temp. is between 50°C (122°F) and 100°C (212°F).
- 2) When throttle valve opens wider than idle position. (idle switch OFF).
- 3) When vehicle speed is higher than 2.2 km/h (1.4 mile/h).
- 4) When engine speed is higher than 3200 r/min with vehicle stopped.

Other than the above, ECM closes the vacuum passage of VSV. As the vacuum is not transmitted to the EGR valve, it remains closed.



EVAPORATIVE EMISSION CONTROL SYSTEM

An evaporative emission control system is used to prevent emission of fuel vapor.

The vapor generated in the fuel tank while driving or the engine at a stop passes through a 2-way check valve and enters the charcoal canister where the charcoal absorbs and stores the fuel vapor.

The canister purge VSV is controlled by ECM according to signals from various sensor.

When following conditions either 1) through 4) or 1) and 5) are satisfied, ECM opens the vacuum passage of VSV.

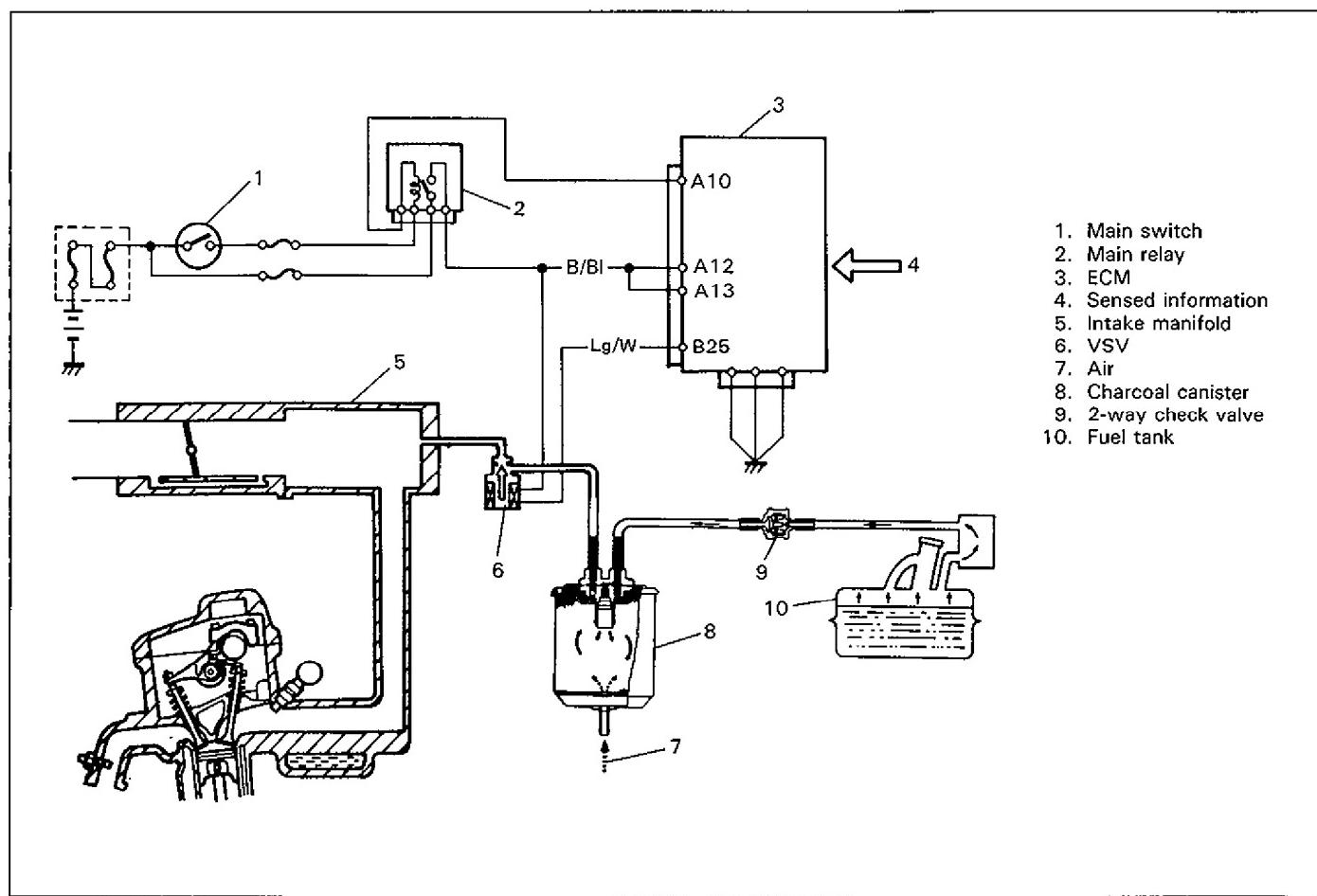
- 1) When engine cooling water temp. is higher than 50°C (122°F).
- 2) When engine speed is higher than 1,300 r/min.
- 3) When throttle valve opens wider than idle position (Idle switch OFF).
- 4) When vehicle speed is higher than 2.2 km/h (1.4 mile/h).

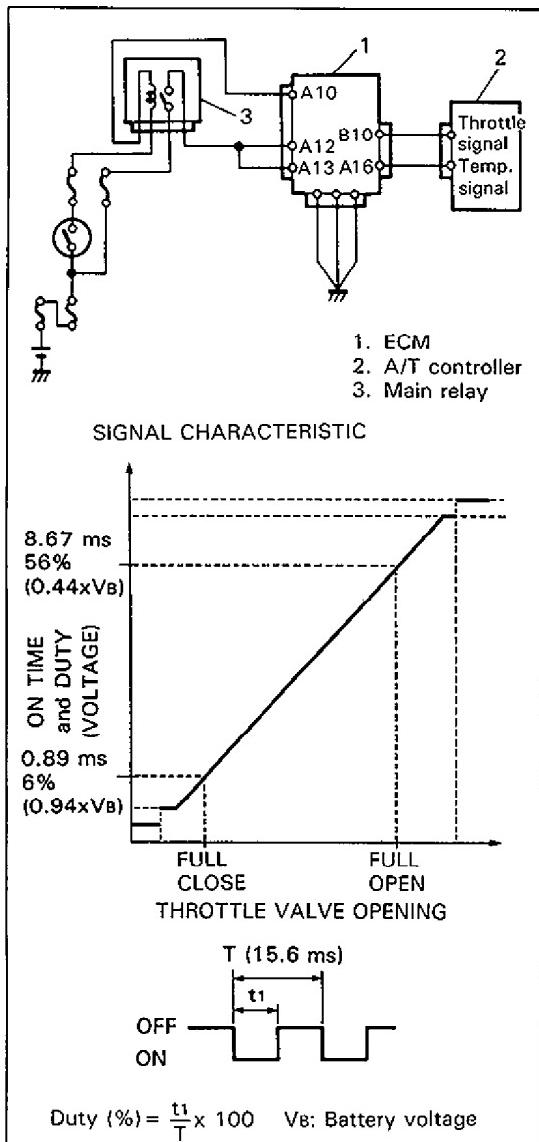
- 5) When engine speed is higher than 3,300 r/min with vehicle stopped.

As a result, fuel vapor in the canister is sucked into intake manifold.

In this state, the canister is purged or cleaned by air drawn through the filter at the bottom of the canister.

The 2-way check valve is provided to keep the pressure in the fuel tank constant. When the pressure in the fuel tank becomes positive and reaches its specified value, it opens the valve to let the vapor flow into the charcoal canister. On the other hand, when the pressure in the fuel tank becomes negative and reaches its specified value, it opens the valve to let the air flow into the fuel tank.





60A50-6E1-31-1S

THROTTLE VALVE OPENING SIGNAL OUTPUT FOR A/T

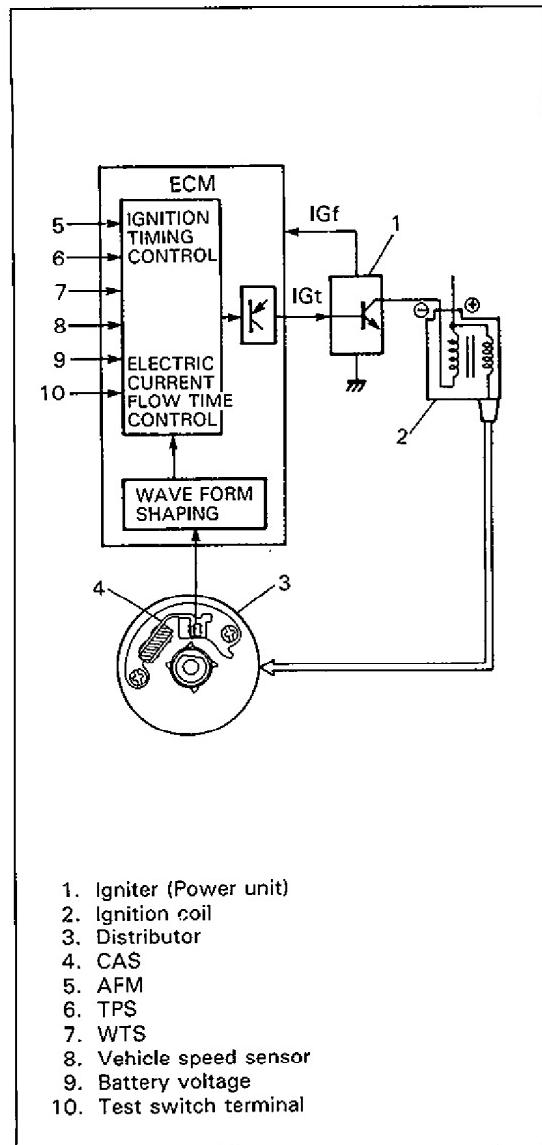
Receiving the throttle valve opening signal from the throttle position sensor, ECM converts it into the duty signal (voltage signal) and sends it to A/T controller. Then A/T controller uses it as the signal to control automatic transmission.

60A50-6E1-31-4S

ENGINE COOLING WATER TEMP. SIGNAL OUTPUT FOR A/T

When the engine cooling water temperature is lower than 55°C (131°F), the switch in ECM turns ON to cause A16 circuit to be grounded. When it is higher than 60°C (140°F), the switch turns OFF to open the circuit.

The A/T controller uses it to control the A/T (Lock-up and overdrive system).



60A50-6E1-32-1S

ESA (ELECTRONIC SPARK ADVANCE) SYSTEM

This system controls electronically the time of electric current flow to ignition primary coil as well as ignition timing.

ECM judges the engine condition by using signals from various sensors, selects the most suitable electric current flow time and ignition timing for that engine condition from among those prestored in its memory and sends an ignition signal to the igniter.

The igniter turns ON and OFF the primary current of the ignition coil according to the signal from ECM.

Control of this system includes three different types as follows.

- Ignition timing control at engine start
- Ignition timing control after engine start
- Electric current flow time control

60A50-6E1-32-4S

Ignition Timing Control at Engine Start

To obtain better starting performance fo the engine at the engine start (when the engine speed is lower than 500 r/min.) ESA system sets the ignition timing to the initial ignition timing (5° BTDC).

Ignition Timing Control After Engine Start

The ignition timing after the engine start is determined as follows so that the spark occurs at the most suitable timing for each engine condition.

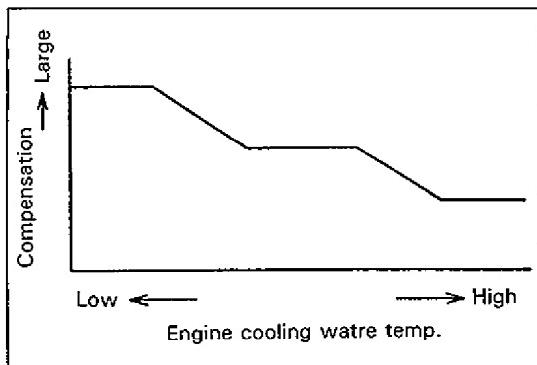
$$\text{Ignition timing} = \text{Initial ignition timing} + \text{Basic ignition advance} + \text{Various compensating advance}$$

60A50-6E1-32-5S

When the idle switch is ON, the ignition timing is determined by adding basic ignition advance, water temperature compensating advance and compensating advance for idle speed stability to the initial ignition timing.

When the idle switch is OFF, the ignition timing is determined by adding basic ignition advance which varies according to the engine speed and fuel injection time and water temperature compensating advance to the initial ignition timing.

60A50-6E1-33-1S



60A50-6E1-33-2S

- **Water temperature compensating advance**

This compensation is added according to the signal from the water temperature sensor which detects the engine cooling water temperature. The amount of compensation is larger when the engine cooling water temperature is lower and smaller when higher.

- **Compensating advance for idle speed stability**

This compensation is carried out to stabilize the engine idle speed.

60A50-6E1-33-3S

Electric Current Flow Time Control

To stabilize the secondary voltage generated in the ignition coil to a proper level, ESA system controls the time of primary current flow to the ignition coil.

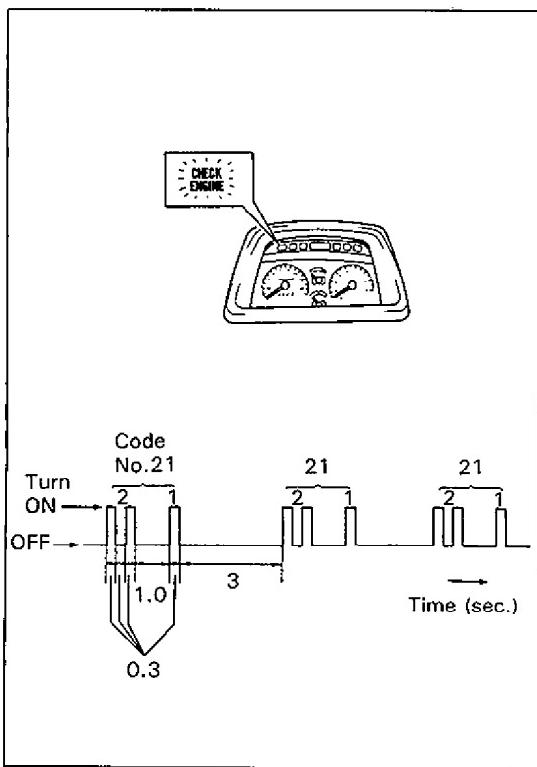
60A50-6E1-33-4S

DIAGNOSIS

ECM has a system self-diagnosis function as described previously (p. 6E1-16).

Investigate where the trouble is by referring to the following "Diagnostic Flow Chart" and "Diagnostic Code".

60A50-6E1-34-1S



60A50-6E1-34-2S

PRECAUTIONS IN DIAGNOSING TROUBLES

[PRECAUTIONS IN IDENTIFYING DIAGNOSTIC CODE]

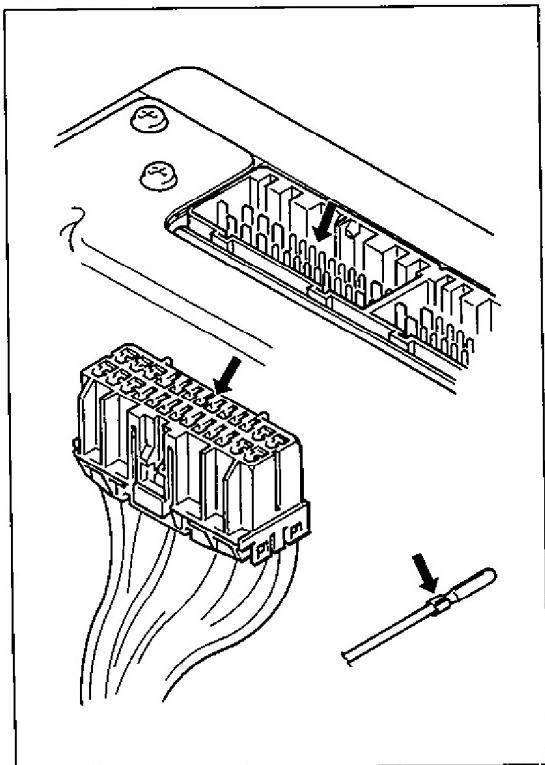
- Before identifying diagnostic code indicated by "CHECK ENGINE" light, don't disconnect couplers from ECM, battery cable from battery, ECM ground wire harness from engine. Such disconnection will erase memorized trouble in ECM memory
- If abnormality or malfunction lies in two or more areas, "CHECK ENGINE" light indicates applicable codes three times each. And flashing of these codes is repeated as long as diagnosis terminal is grounded and ignition switch is held at ON position.
- Take a note of diagnostic code indicated first.

[INTERMITTENT TROUBLES]

- There are cases where "CHECK ENGINE" light indicates a diagnostic code representing a trouble which occurred only temporarily and has gone. In such case, it may occur that good parts are replaced unnecessarily. To prevent such an accident, be sure to follow instructions given below when checking by using "Diagnostic Flow Chart".
 - * When trouble can be identified, it is not an intermittent one:
Check sensor (actuator), wires and each connection and if they are all in good condition, substitute a known-good ECM and recheck.

- * When trouble can not be identified but "CHECK ENGINE" light indicates a trouble code:
Diagnose trouble by using that code No. and if sensor (actuator), wires and each connection are all in good condition, erase diagnostic code in ECM memory. Then conduct a test run and check what "CHECK ENGINE" light indicates. Only when it indicates trouble code again, substitute a known-good ECM and check again.
If it indicates not trouble code but normal code No. 12, it means that an intermittent trouble did occur and has gone. In this case, check wires and connections carefully again.

60A50-6E1-35-1S



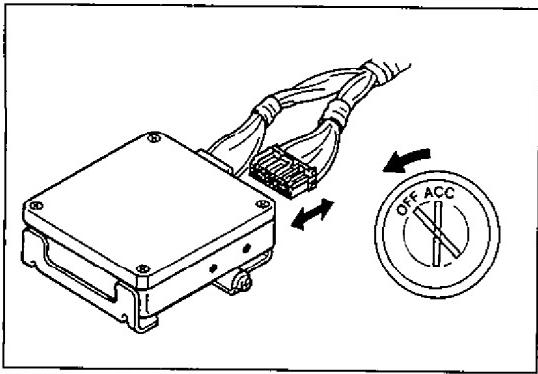
60A50-6E1-35-3S

[NOTES ON SYSTEM CIRCUIT INSPECTION]

- Intermittent troubles
Most intermittent problems are caused by faulty electrical connections or wiring.
Perform careful check of suspect circuits for:
 - Poor mating of coupler halves, or terminals not fully seated in coupler body (backed out).
 - Improperly formed or damaged terminals. All coupler terminals in problem circuit should be carefully reformed to increase contact tension.
 - Poor terminal to wire connection.
- When there is a question "Are couplers connected properly?" in FLOW CHART, check male half of terminal for bend and female half for excessive opening, terminal for poor locking (looseness), corrosion, dust, etc.

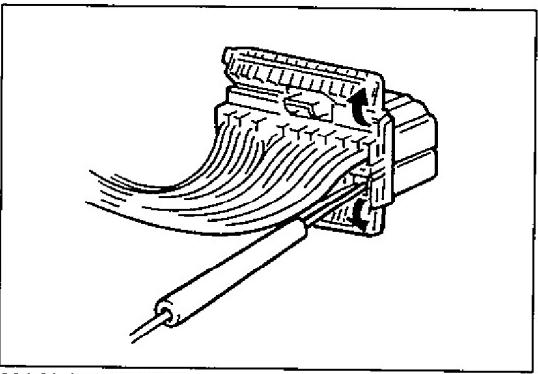
- Never connect any tester (voltmeter, ohmmeter, or whatever) to ECM when its coupler is disconnected. Attempt to do it may cause damage to ECM.
- Never connect an ohmmeter to ECM with its coupler connected to it. Attempt to do it may cause damage to ECM and sensors.
- Be sure to use a voltmeter with high impedance ($M\Omega/V$ minimum) or a digital type voltmeter. Any other voltmeter should not be used because accurate measurements are not obtained.

60A50-6E1-35-5S



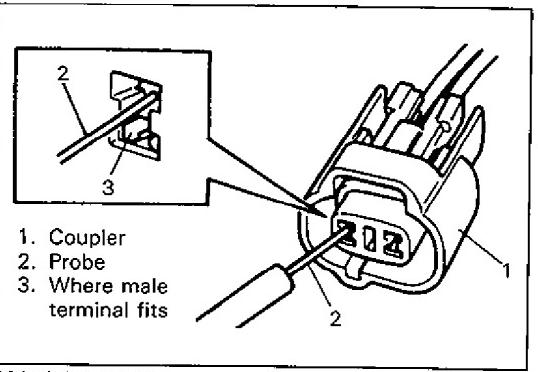
60A50-6E1-36-1S

- When disconnecting and connecting coupler, make sure to turn ignition switch OFF, or ECM may get damaged.



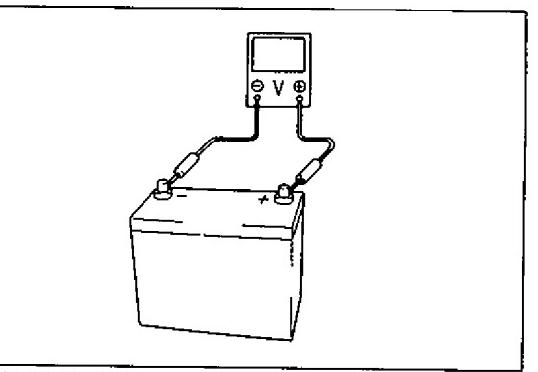
60A50-6E1-36-2S

- When connecting a probe of ohmmeter, voltmeter, etc. to coupler terminal, be sure to connect it from wire harness side of coupler.



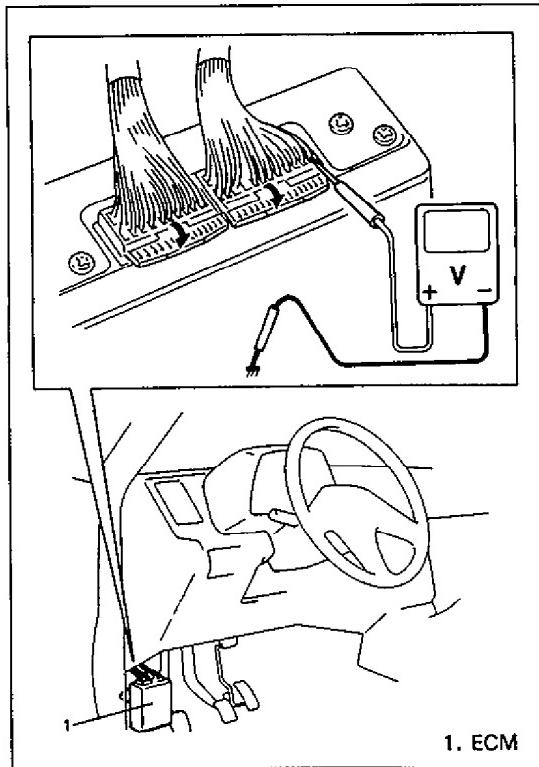
60A50-6E1-36-3S

- When connecting meter probe from terminal side of coupler because it can't be connected from harness side, use extra care not to bend male terminal of coupler or force its female terminal open for connection.
In case of such coupler as shown at the left, connect probe as shown to avoid opening female terminal.
Never connect probe where male terminal is supposed to fit.



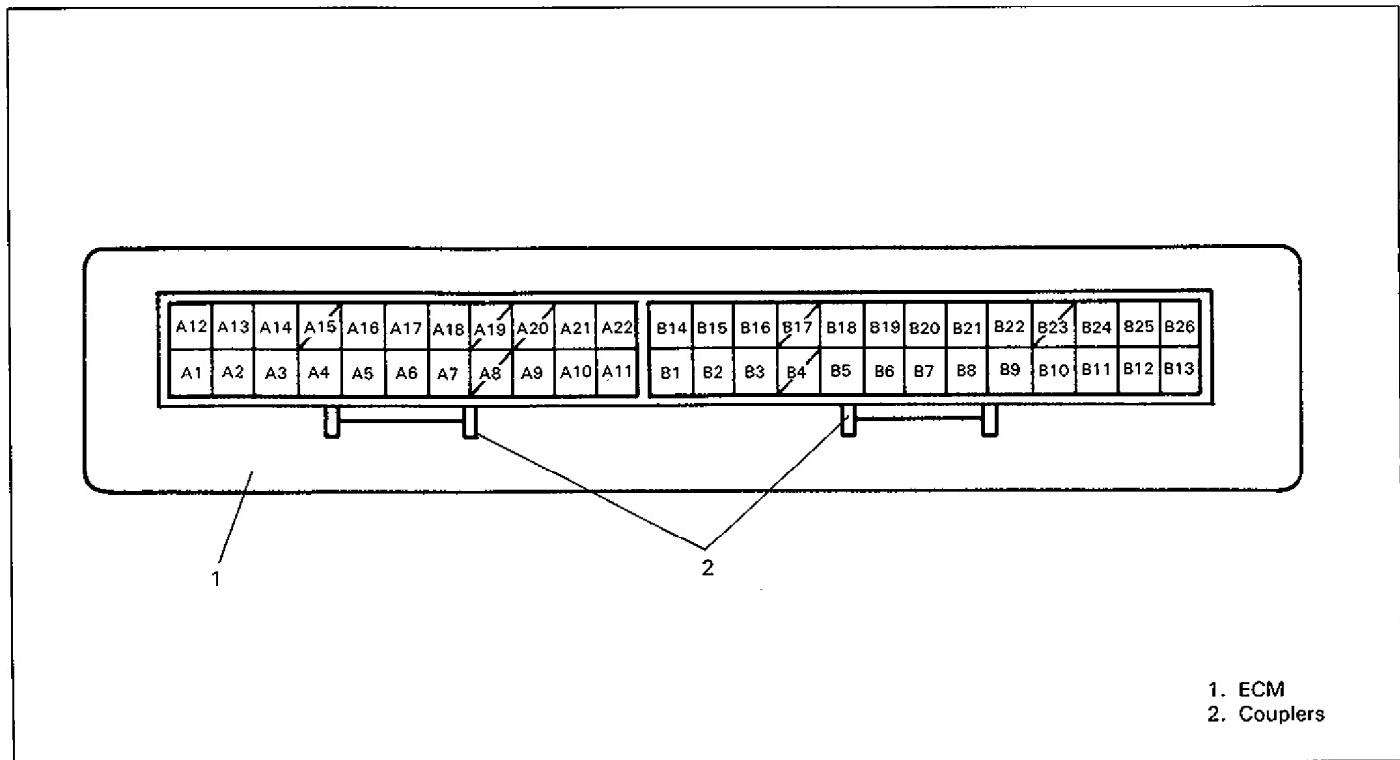
60A50-6E1-36-4S

- Before measuring voltage at each terminal, check to make sure that battery voltage is 11V or higher. Such terminal voltage check at low battery voltage will lead to erroneous diagnosis.



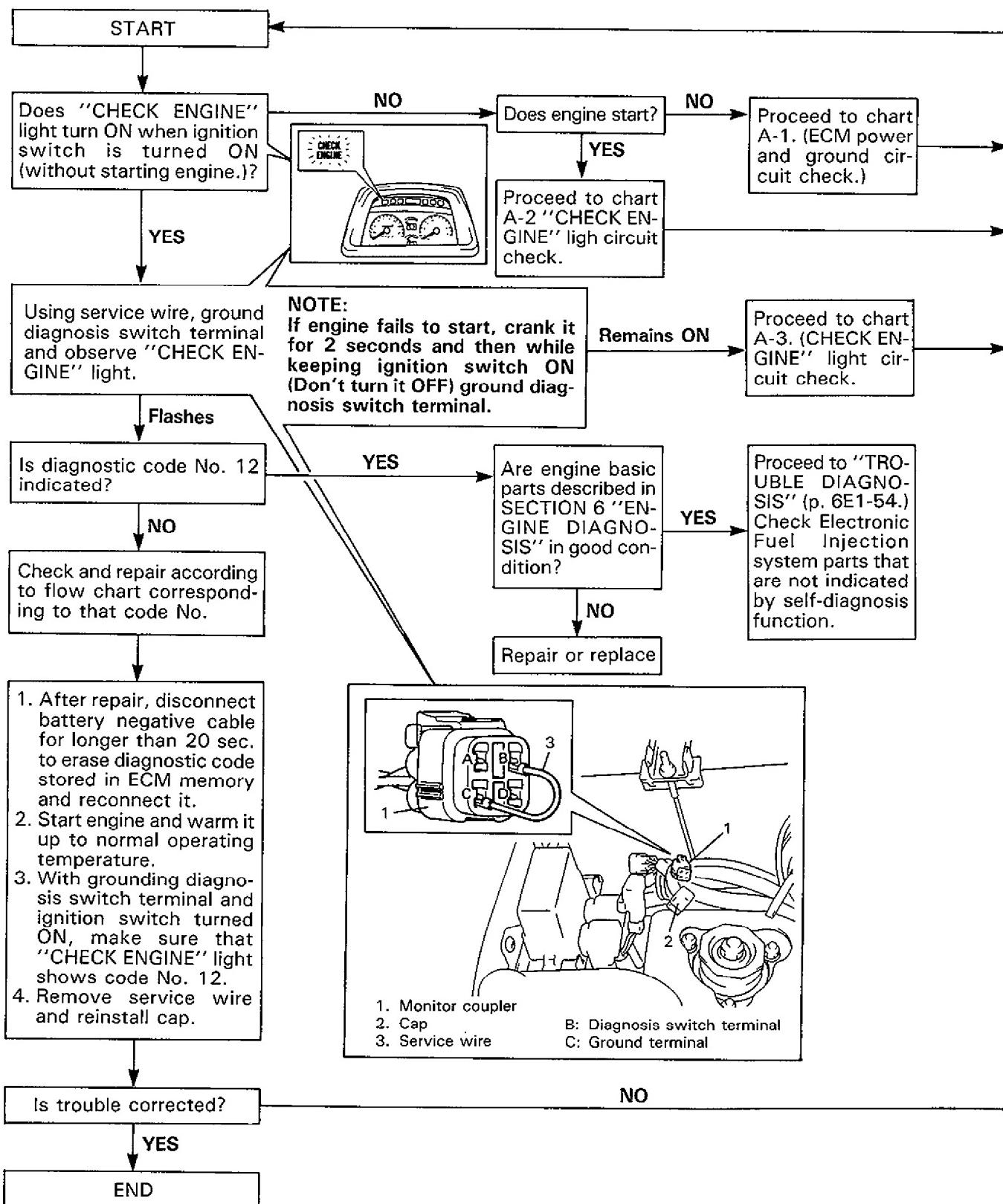
60A50-6E1-37-1S

- When checking voltage at each terminal of the coupler which is connected to ECM, be sure to connect negative probe to body ground. Any other way is prohibited even by accident.
Applying it improperly may cause the sensor or ECM to be shorted and damaged.



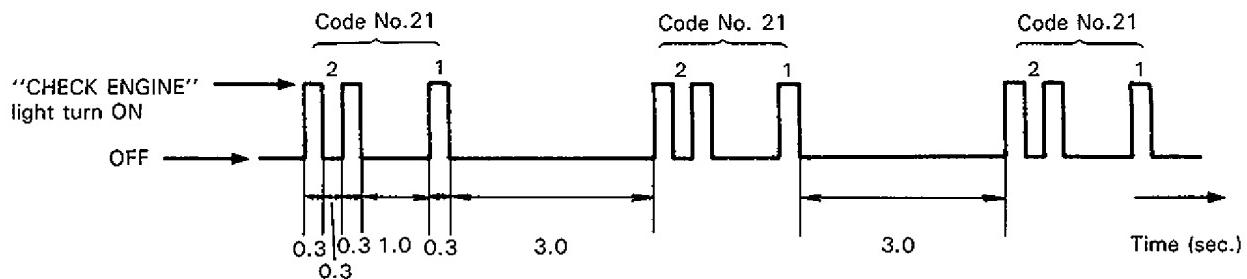
60A50-6E1-37-3S

DIAGNOSTIC FLOW CHART



DIAGNOSIS CODE TABLE

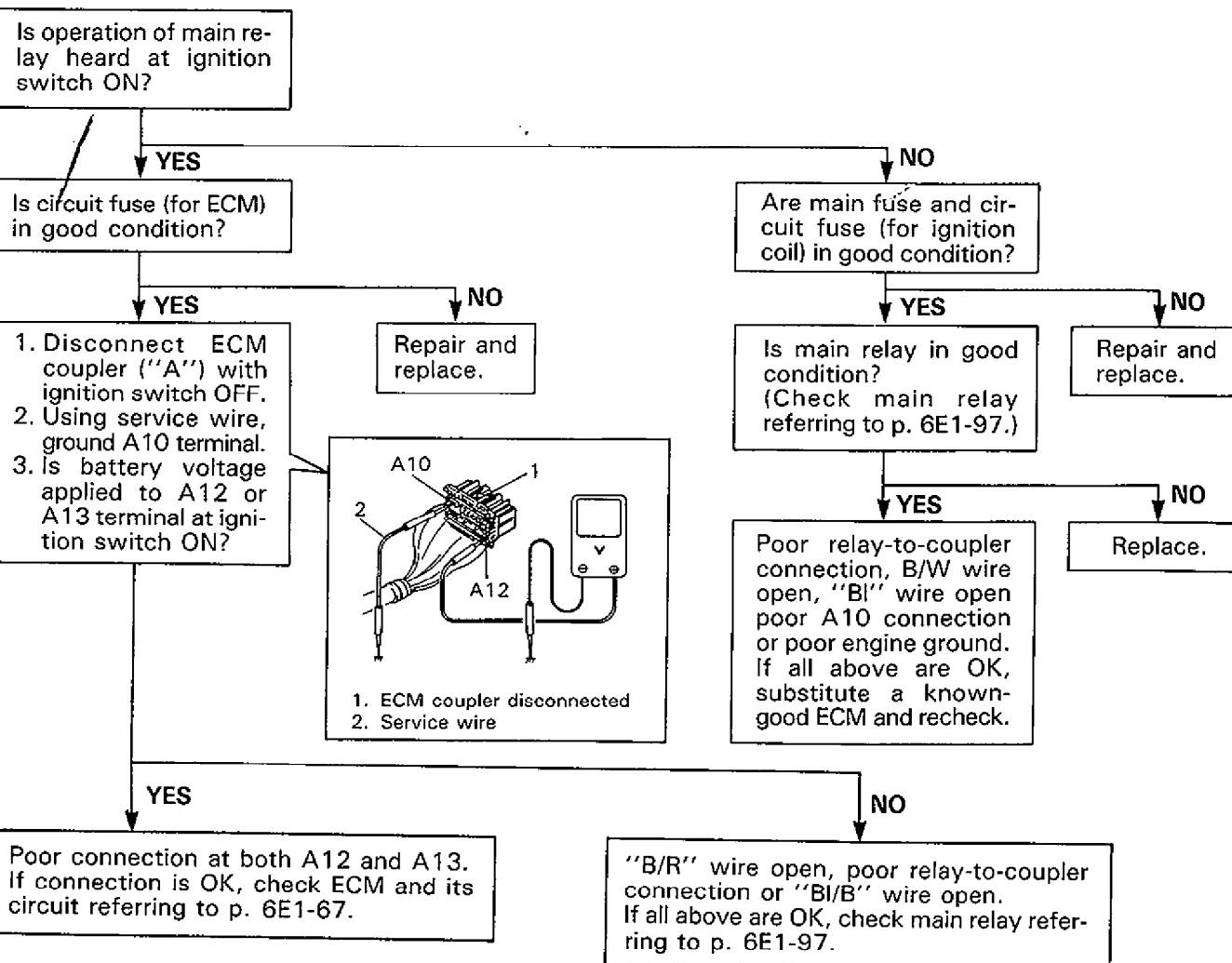
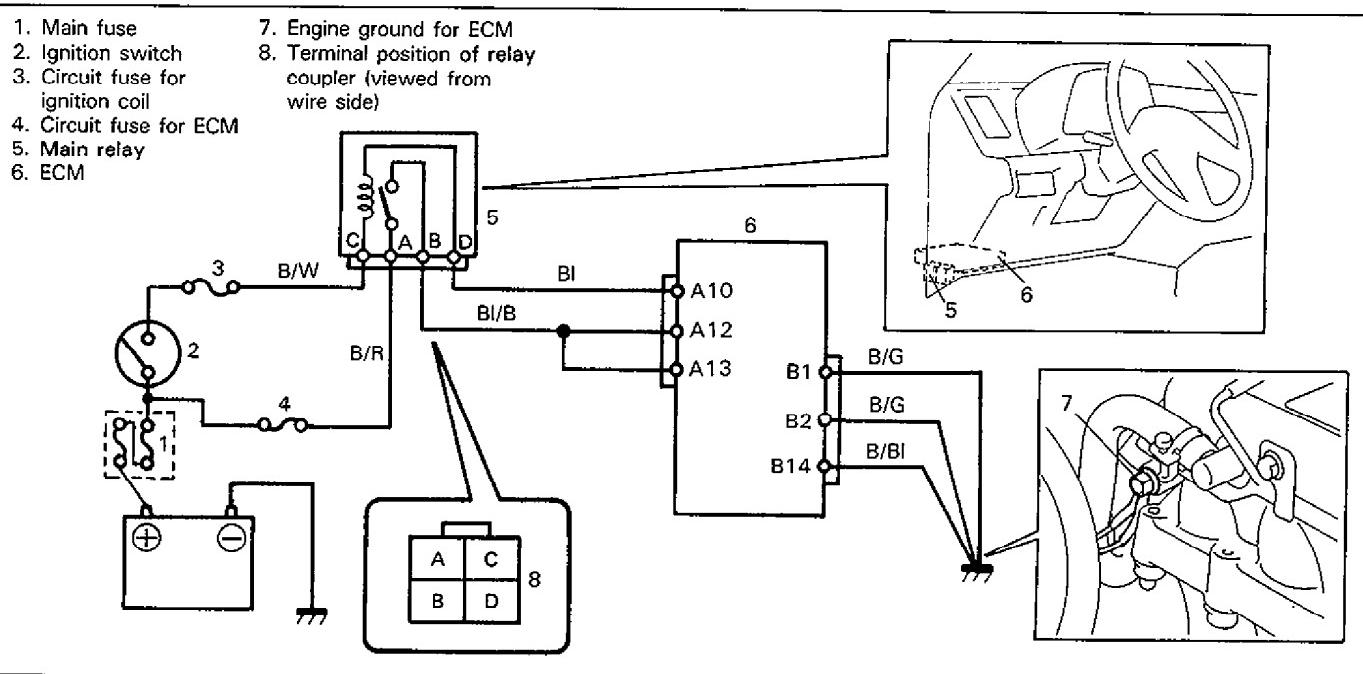
EXAMPLE: When throttle position sensor is defective (Code No. 21)



DIAGNOSTIC CODE NO.	"CHECK ENGINE" LIGHT FLASHING PATTERN	DIAGNOSTIC ITEM	DIAGNOSIS
13		Oxygen sensor (If equipped)	
14			
15		WTS	
21		TPS	
22			
23		ATS	
25			
24		VSS	
33		AFM	
41		Ignition fail safe signal	
42		CAS	
ON		ECM	ECM failure.
12		Normal	This code appears when none of the other codes (above codes) are identified.

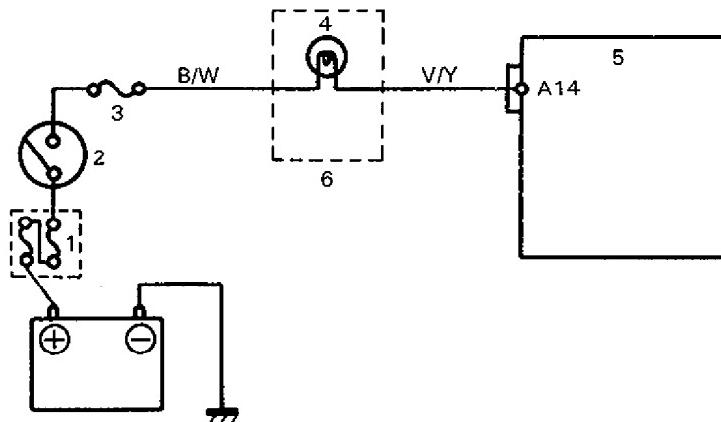
A-1 ECM POWER AND GROUND CIRCUIT CHECK

("'CHECK ENGINE' LIGHT DOESN'T LIGHT AT IGNITION SWITCH ON AND ENGINE DOESN'T START THOUGH IT IS CRANKED UP.)



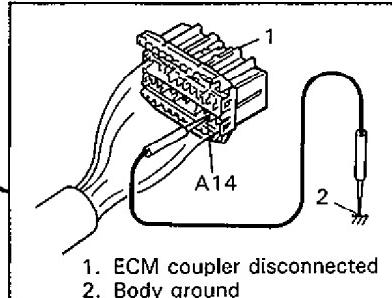
A-2 "CHECK ENGINE" LIGHT CIRCUIT CHECK

(CHECK ENGINE" LIGHT DOESN'T LIGHT AT IGNITION SWITCH ON THOUGH ENGINE STARTS.)



1. Main fuse
2. Ignition switch
3. Circuit fuse
4. "CHECK ENGINE" light bulb
5. ECM
6. Combination meter

1. With ignition switch turned OFF, disconnect coupler ("A") from ECM.
2. Body-ground terminal A14 in coupler disconnected.
3. Does "CHECK ENGINE" light turn ON at ignition switch ON?



1. ECM coupler disconnected
2. Body ground

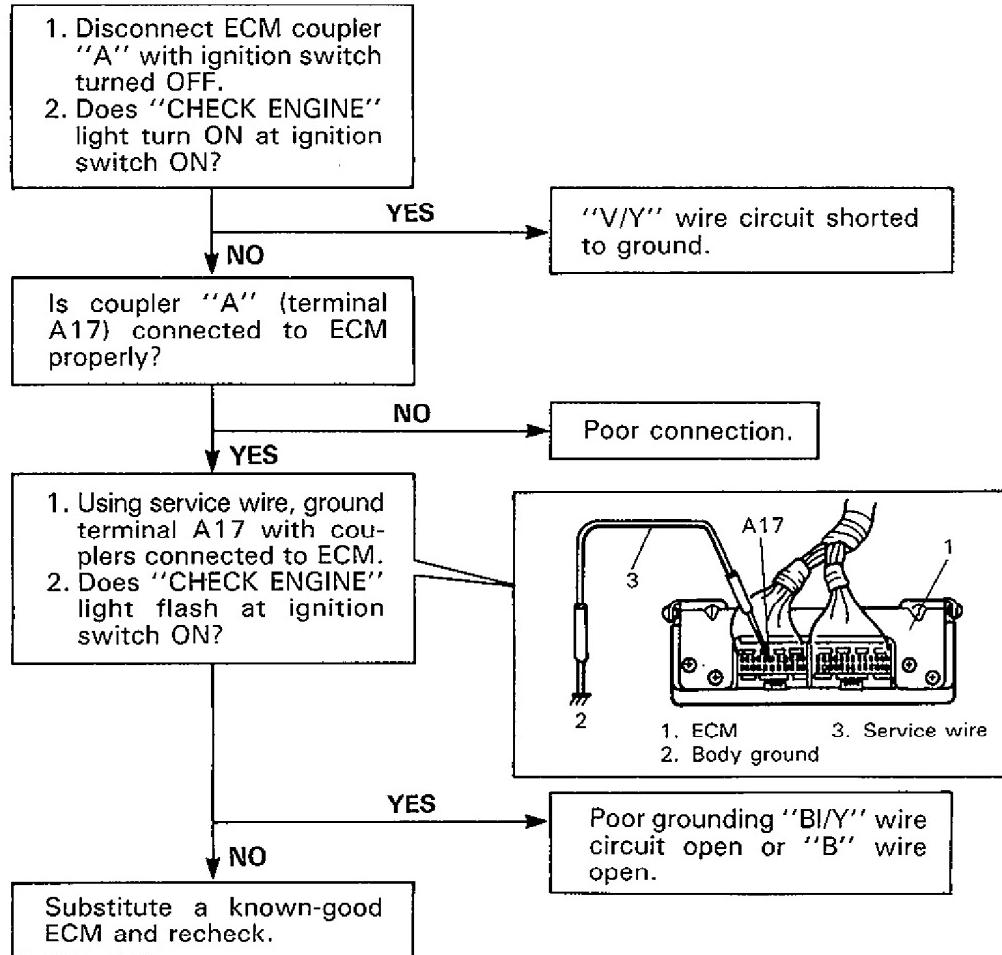
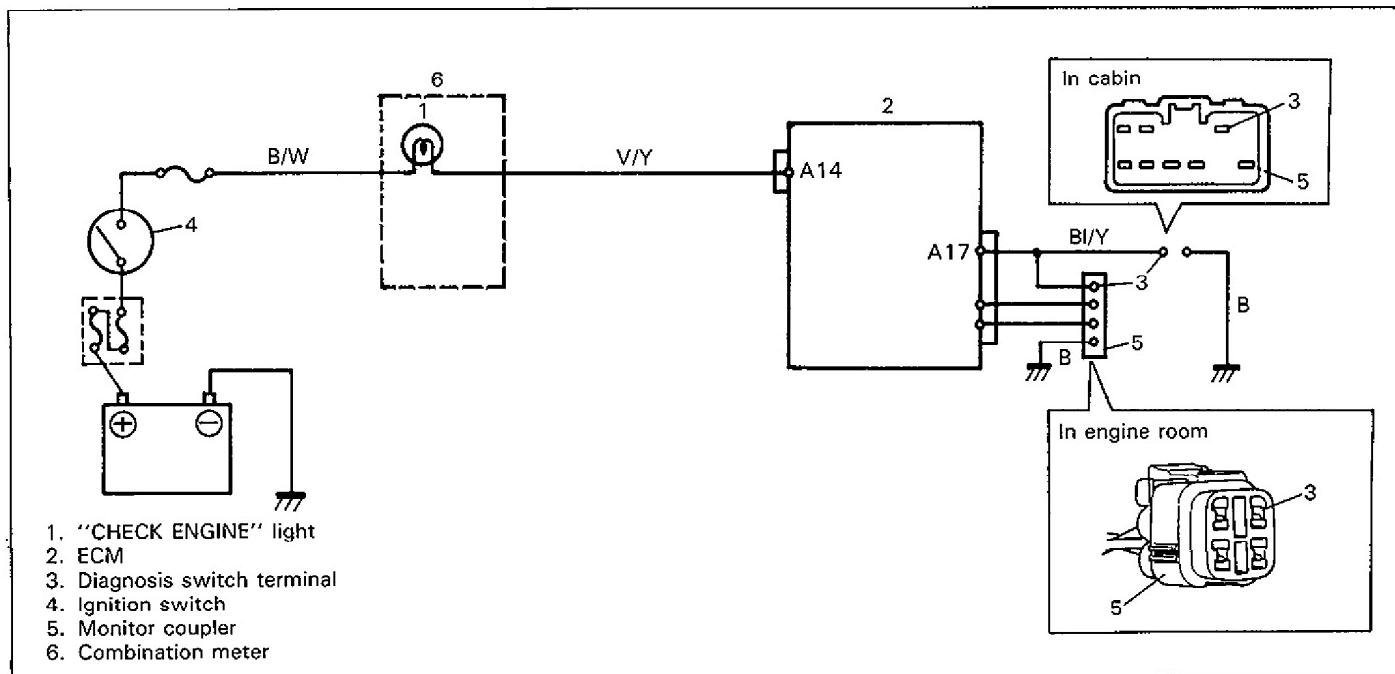
↓ YES
Poor A14 connection.
If connection is OK, substitute a known-good ECM and recheck.

NO

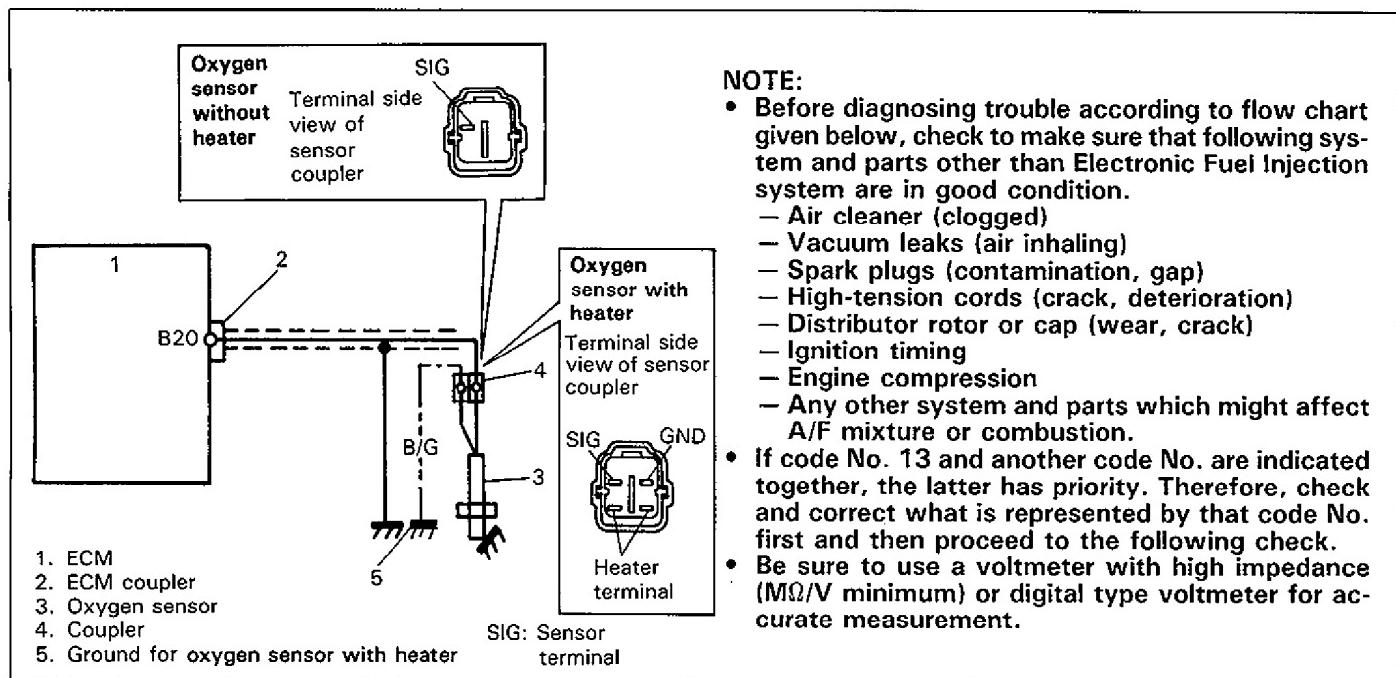
Bulb burned out, "V/Y" wire circuit open or "B/W" wire circuit open.

A-3 "CHECK ENGINE" LIGHT CIRCUIT CHECK

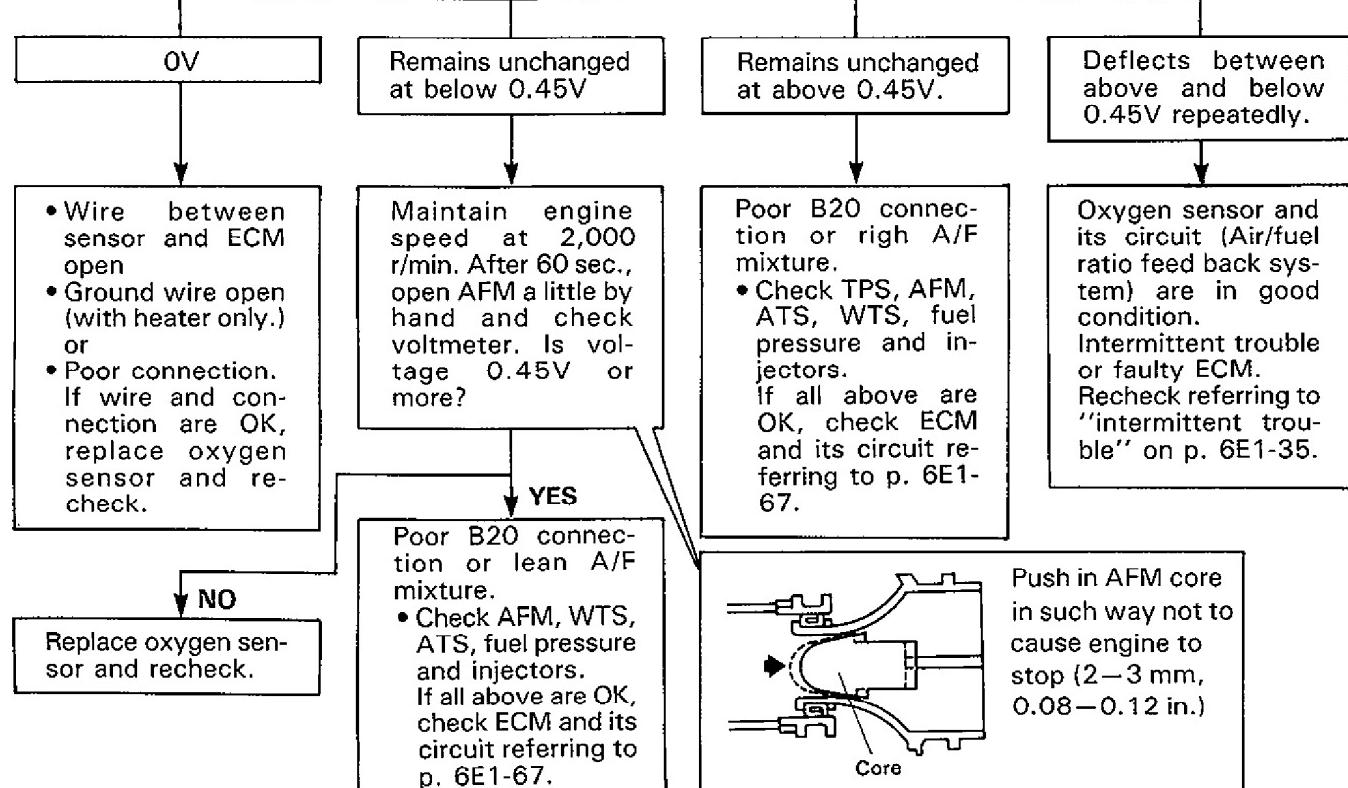
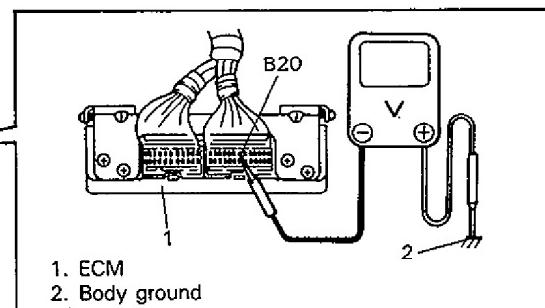
(""CHECK ENGINE" LIGHT DOESN'T FLASH OR JUST REMAINS ON EVEN WITH GROUNDING DIAGNOSIS SWITCH TERMINAL.)

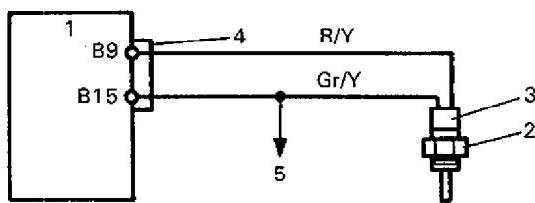


CODE NO. 13 OXYGEN SENSOR CIRCUIT (IF EQUIPPED) (SIGNAL VOLTAGE DOESN'T CHANGE)



1. Remove ECM and connect couplers to ECM.
2. Warm up engine to normal operating temperature.
3. Connect voltmeter between "B20" terminal of ECM coupler and body ground.
4. Maintain engine speed at 2000 r/min. After 60 seconds, check voltmeter.

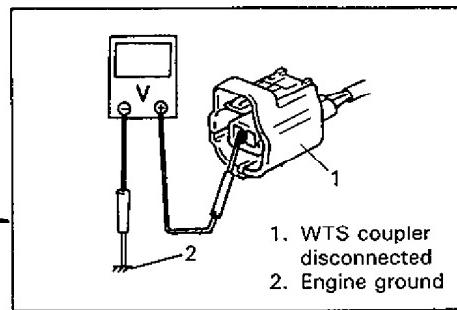


**CODE NO. 14 WTS (WATER TEMPERATURE SENSOR) CIRCUIT (LOW TEMPERATURE INDICATED,
SIGNAL VOLTAGE HIGH)**
**NOTE:**

When Code Nos. 14, 21, 23 and 33 are indicated together, it is possible that "Gr/Y" wire is open or B15 terminal connection is poor.

1. ECM
2. WTS
3. Coupler
4. ECM coupler
5. To other sensors

1. Disconnect WTS coupler with ignition switch OFF.
2. With ignition switch ON, check voltage at "R/Y" wire terminals of WTS coupler. Is it about 4–5V?

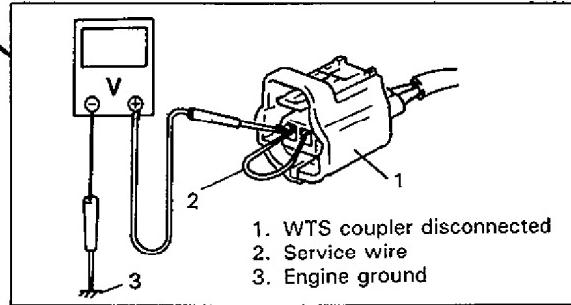


YES

1. Using service wire, connect WTS coupler terminals.
2. Check voltage at "R/Y" wire terminal of WTS coupler with ignition switch ON. Is it below 0.15V?

"R/Y" wire open, poor B9 connection or "R/Y" wire shorted to power circuit.
If wire and connection are OK, substitute a known-good ECM and recheck.

NO



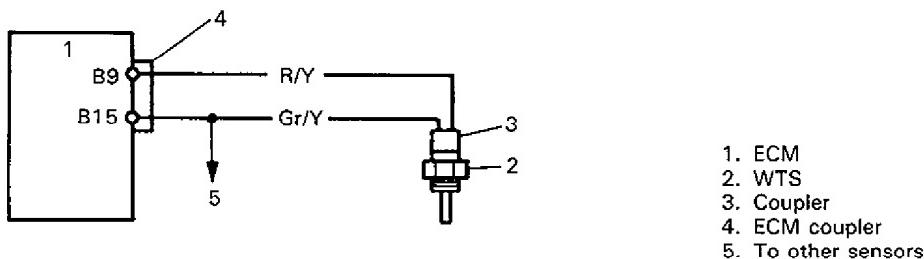
NO

"Gr/Y" wire open or poor B15 connection.
If wire and connection are OK, faulty ECM. Substitute a known-good ECM and recheck.

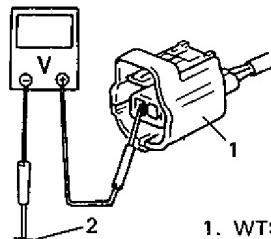
Poor WTS-to-WTS coupler connection or faulty WTS.
If connection and WTS are OK, intermittent trouble or faulty ECM. Recheck referring to "Intermittent trouble" on p. 6E1-35.

YES

**CODE NO. 15 WTS (WATER TEMPERATURE SENSOR) CIRCUIT (HIGH TEMPERATURE INDICATED,
SIGNAL VOLTAGE LOW)**



1. Disconnect WTS coupler with ignition switch OFF.
2. With ignition switch ON, is voltage applied to "R/Y" wire terminal of WTS coupler 4V or more?



YES

Check WTS referring to p. 6E1-94.
Is it in good condition?

NO

"R/Y" wire shorted to "Gr/Y" wire or ground circuit.
If wire is OK, substitute a known-good ECM and recheck.

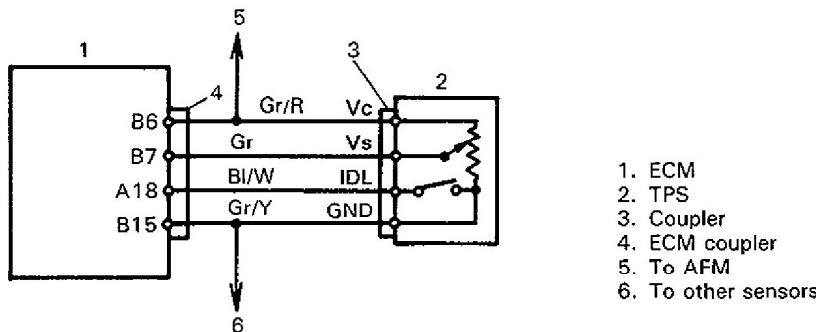
YES

Intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E1-35.

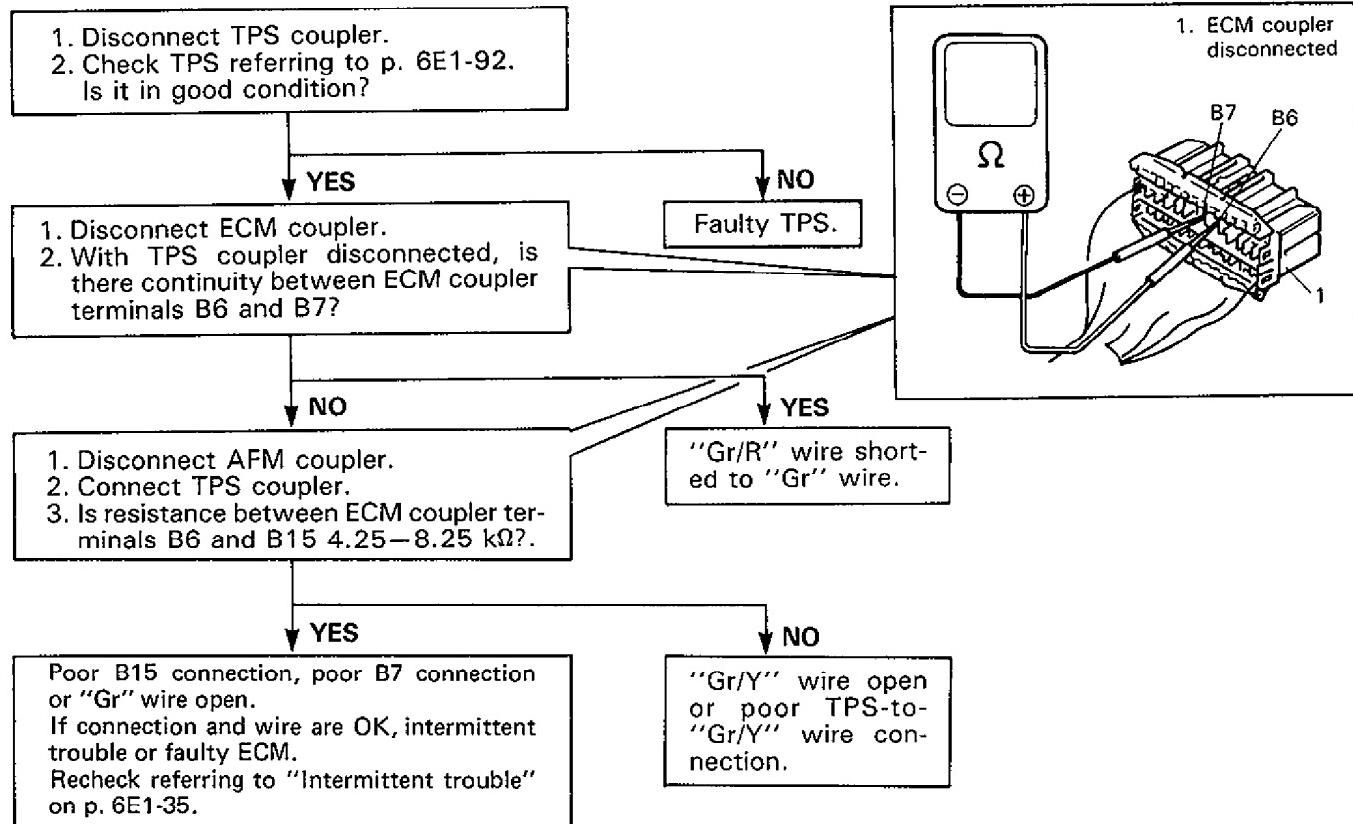
NO

Faulty WTS.

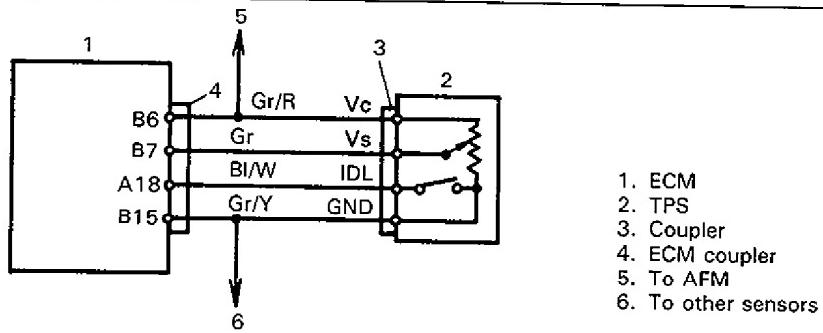
CODE NO. 21 TPS (THROTTLE POSITION SENSOR) CIRCUIT (SIGNAL VOLTAGE HIGH)



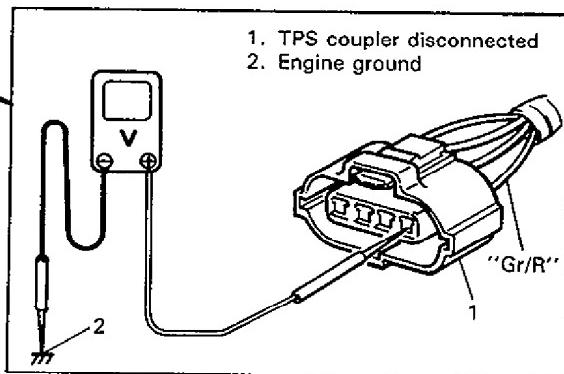
NOTE:
Be sure to turn OFF ignition switch for this check.



CODE NO. 22 TPS (THROTTLE POSITION SENSOR) CIRCUIT (SIGNAL VOLTAGE LOW)



1. Disconnect TPS coupler with ignition switch OFF.
2. With ignition switch ON, is voltage applied to "Gr/R" wire terminal of TPS coupler about 4-5V?



YES

Check TPS referring to p. 6E1-92.
Is it in good condition?

NO

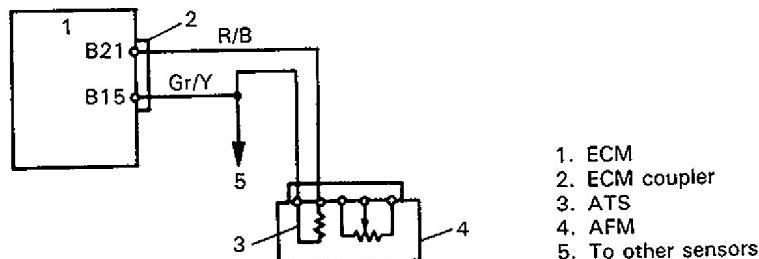
"Gr/R" wire open, "Gr/R" wire shorted to ground circuit or "Gr/Y" wire, or poor B6 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

YES

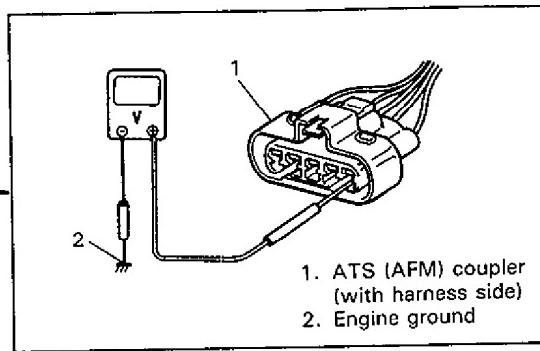
"Gr" wire shorted to ground circuit or poor TPS-to-TPS coupler connection.
If wire and connections are OK, intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E1-35.

Faulty TPS.

**CODE NO. 23 ATS (AIR TEMPERATURE SENSOR) CIRCUIT (LOW TEMPERATURE INDICATED,
SIGNAL VOLTAGE HIGH)**



1. Disconnect ATS (AFM) coupler with ignition switch OFF.
2. With ignition switch ON, check voltage at "R/B" wire terminal of ATS coupler. Is it above 4—5V?

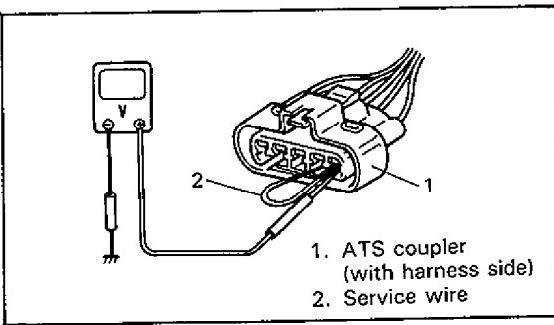


YES

1. Using service wire, connect ATS coupler terminals.
2. Check voltage at "R/B" wire terminal of ATS coupler with ignition switch ON. Is it below 0.15V?

- "R/B" wire open, poor B21 connection or "R/B" wire shorted to power circuit.
If wire and connection are OK, substitute a known-good ECM and recheck.

NO



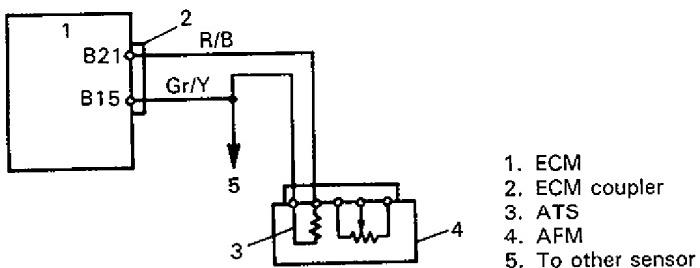
YES

- Faulty ATS or poor ATS coupler connection.
If ATS and connection are OK, intermittent trouble or faulty ECM. Recheck referring to "Intermittent trouble" on p. 6E1-35.

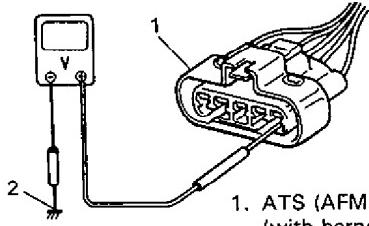
- "Gr/Y" wire open or poor B15 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

NO

**CODE NO. 25 ATS (AIR TEMPERATURE SENSOR) CIRCUIT (HIGH TEMPERATURE INDICATED,
SIGNAL VOLTAGE LOW)**



1. Disconnect ATS (AFM) coupler with ignition switch OFF.
2. With ignition switch ON, is voltage applied to "R/B" wire terminal of ATS coupler 4V or more?



YES

Check ATS referring to p. 6E1-91.
Is it in good condition?

NO

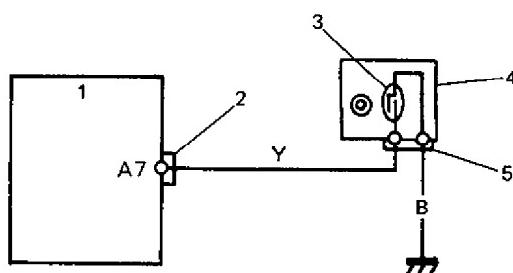
"R/B" wire shorted to ground circuit.
If wire is OK, substitute a known-good ECM and recheck.

YES

Intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E1-35.

NO
Faulty ATS.

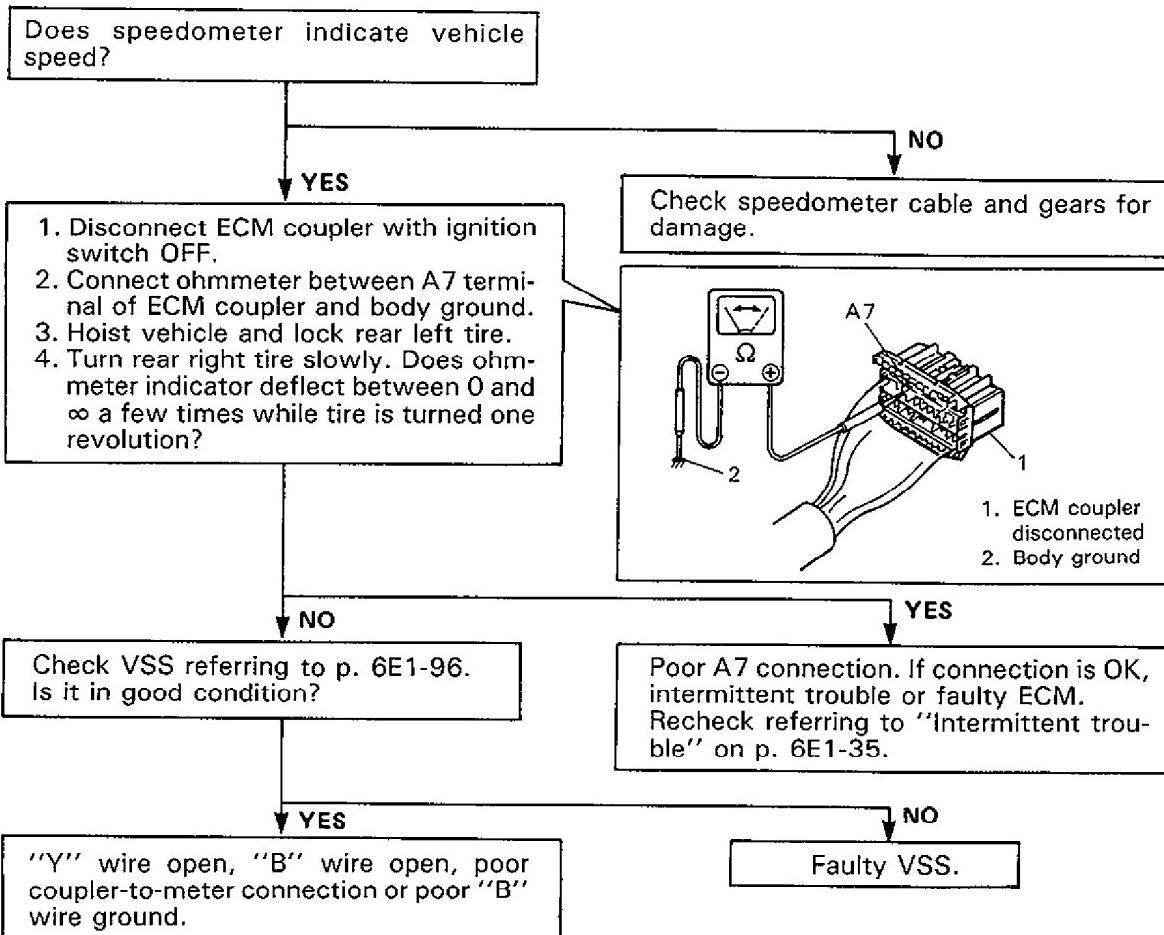
**CODE NO. 24 VSS (VEHICLE SPEED
SENSOR) CIRCUIT (VEHICLE SPEED SIGNAL NOT INPUTTED ALTHOUGH FUEL
IS KEPT CUT FOR LONGER THAN 3 SECONDS)**



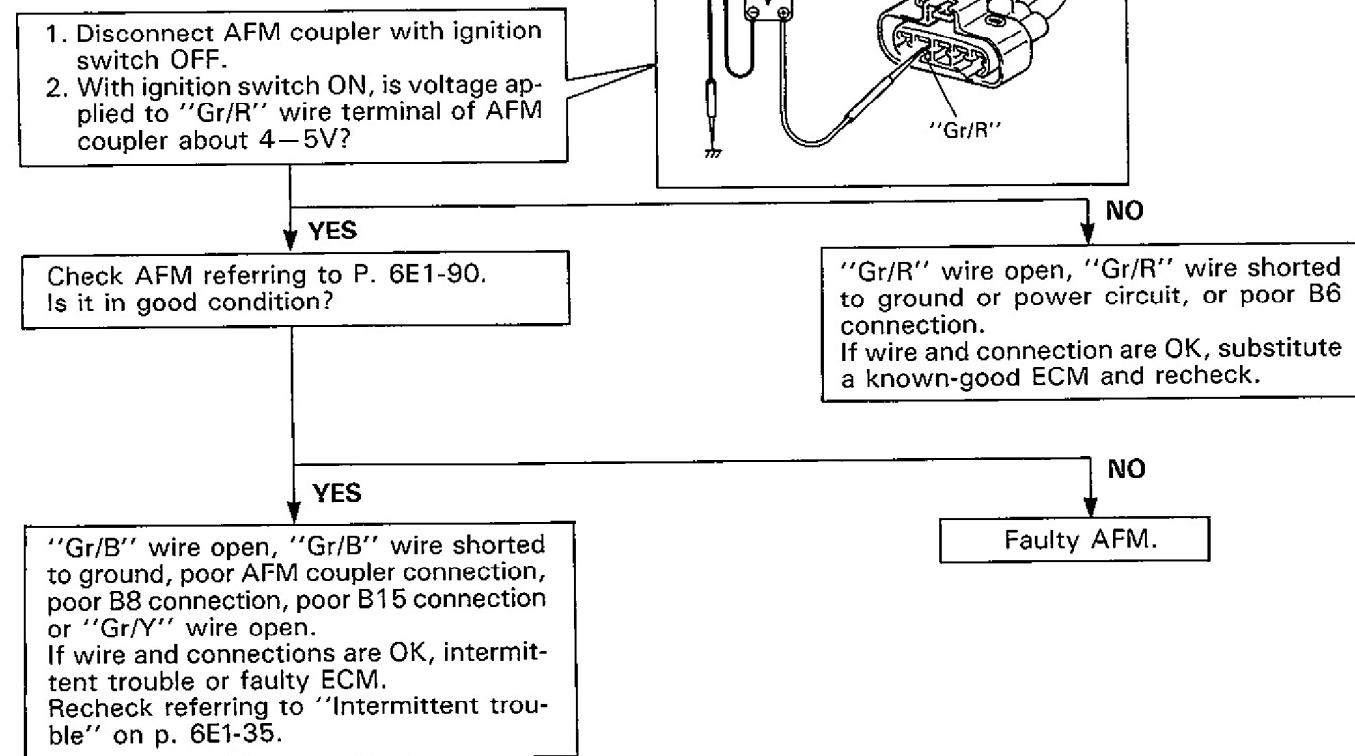
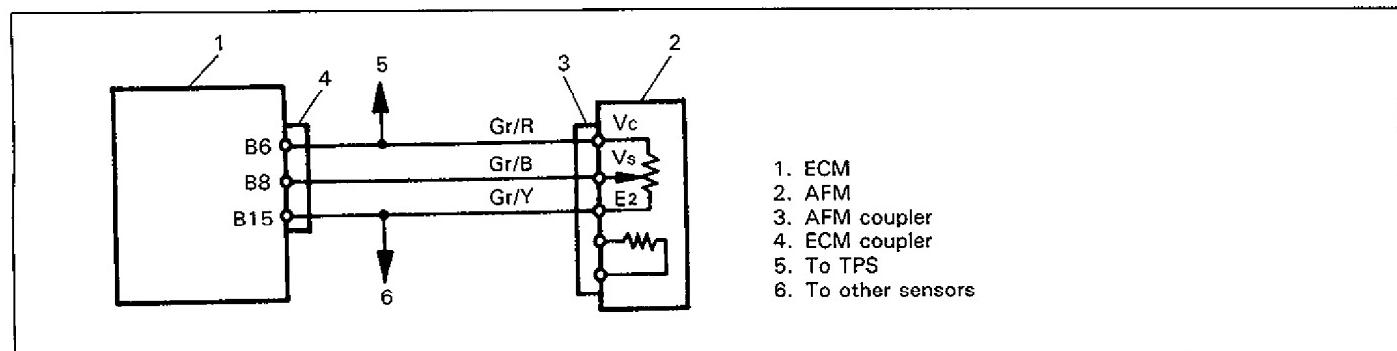
1. ECM
2. ECM coupler
3. VSS
4. Speedometer
5. Coupler

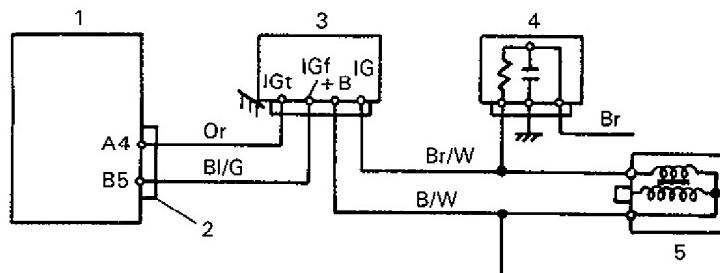
NOTE:

Be sure to turn OFF ignition switch for this check.



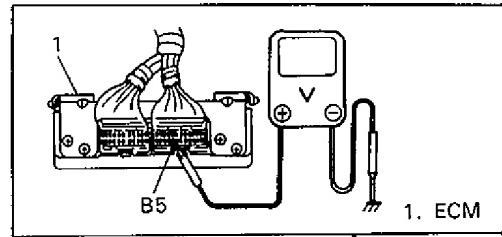
CODE NO. 33 AFM (AIR FLOW METER) CIRCUIT (SIGNAL VOLTAGE LOW OR HIGH)



CODE NO. 41 IGNITION FAIL SAFE SIGNAL CIRCUIT (IGNITION FAIL SAFE SIGNAL NOT INPUTTED 8 TIMES CONTINUOUSLY)


1. ECM
2. ECM coupler
3. Igniter (power unit)
4. Noise suppressor
5. Ignition coil

Check ignition spark referring to SECTION 6F1.
Is it in good condition?



NO

YES

1. Disconnect igniter coupler.
2. Connect analog type voltmeter between "IGt" terminal of igniter coupler and engine ground.
3. Is voltage pulse output within 0–5V while engine cranking?

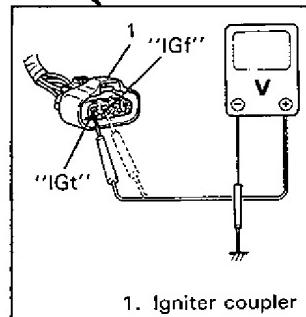
1. Remove ECM.
2. Is 0–2V or 4–5V obtained between B5 terminal (IGf) and ground when ignition switch is ON?
Also, does voltage at engine cranking vary from that at ignition switch ON?

NO

YES

"Or" wire open or poor A4 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

1. Check following parts referring to SECTION 6F1.
 - Ignition coil
 - Noise suppressor
 - Wire harnesses and couplers
2. If all above are OK, replace igniter.



1. Disconnect igniter coupler.
2. Is about 5V voltage obtained between "IGf" terminal of igniter coupler and ground when ignition switch is ON?

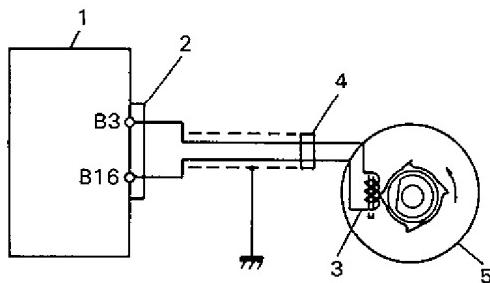
NO

YES

"BI/G" wire open or poor B5 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

Poor "IGf" connection of igniter or faulty igniter.

CODE NO.42 CRANK ANGLE SENSOR CIRCUIT (SENSOR SIGNAL NOT INPUTTED FOR 2 SECONDS AT ENGINE CRANKING)



1. ECM
2. ECM coupler
3. Crank angle sensor
4. Coupler
5. Distributor

Check signal rotor air gap referring to SECTION 6F1.
Is it in good condition?

YES

Check crank angle sensor referring to SECTION 6F1.
Is it in good condition?

YES

Open wires between sensor and ECM,
poor B3 connection, poor B16 connection
or sensor wires shorted to each other.
If wires and connections are OK, intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E1-35.

NO

Mal-adjusted air gap.

NO

Faulty crank angle sensor.

TROUBLE DIAGNOSIS

This section describes trouble diagnosis of Electronic Fuel Injection system parts whose trouble is not indicated by the self-diagnosis function.

When diagnostic code No. 12 is indicated by the self-diagnosis function and assuredly those engine basic parts as described in "ENGINE DIAGNOSIS" are all in good condition, check below Electronic Fuel Injection system parts which may be a possible cause for each symptom of the engine.

60A50-6E1-54-1S

SYMPTOM	POSSIBLE CAUSE	INSPECTION
Hard or no starting (Engine cranks OK)	<ul style="list-style-type: none"> • Shortage of fuel in fuel tank • Vacuum leaks (or air inhaled) in air intake system • Faulty fuel pump or its circuit open • Fuel injector circuit faulty • Fuel pressure out of specification • Poor performance of WTS, ATS, or AFM • Faulty ECM 	<p>Check if fuel pressure is felt at fuel return hose for 2 seconds after ignition switch ON. If not, advance to Diagnostic Flow Chart B-1.</p> <p>Diagnostic Flow Chart B-2.</p> <p>Diagnostic Flow Chart B-3.</p> <p>See p. 6E1-94, 6E1-91 or 6E1-90.</p> <p>See p. 6E-67.</p>
NOTE: If engine is warm and hard to start but starts easily with accelerator pedal depressed, check ISC solenoid valve and its circuit first.		
Engine fails to idle	<ul style="list-style-type: none"> • Shortage of fuel in fuel tank • Vacuum leaks (or air inhaled) in air intake system • Maladjusted idle speed adjusting screw • Faulty ISC solenoid valve or its circuit • Faulty air valve • Faulty EGR system (if equipped) • Fuel pressure out of specification • Faulty injector(s) • Poor performance of WTS, ATS or AFM • Faulty ECM • Maladjusted idle mixture (For vehicle without oxygen sensor) 	<p>See page 6E1-74</p> <p>Check ISC solenoid valve or its circuit.</p> <p>Diagnostic Flow Chart B-5</p> <p>Diagnostic Flow Chart B-3</p> <p>See p. 6E1-85</p> <p>See p. 6E1-94, 6E1-91 or 6E1-90</p> <p>See p. 6E1-67</p> <p>See p. 6E1-76</p>

60A50-6E1-54-2S

SYMPTOM	POSSIBLE CAUSE	INSPECTION
Improper engine idle speed	<ul style="list-style-type: none"> • Maladjusted accelerator cable play • Vacuum leaks (or air inhaled) in air intake system • Maladjusted idle speed adjusting screw • Faulty idle switch in TPS • Faulty ISC solenoid valve control system • Faulty air valve • Fuel pressure out of specification • Faulty injector(s) • Poor performance of WTS, ATS, TPS or AFM • Faulty ECM • Maladjusted idle mixture (For vehicle without oxygen sensor) 	<p>See p. 6E1-73</p> <p>See p. 6E1-74</p> <p>See p. 6E1-92</p> <p>Diagnostic Flow Chart B-4</p> <p>Diagnostic Flow Chart B-3</p> <p>See p. 6E1-85</p> <p>See p. 6E1-94, 6E1-91, 6E1-92 or 6E1-90</p> <p>See p. 6E1-67</p> <p>See p. 6E1-76</p>

NOTE:

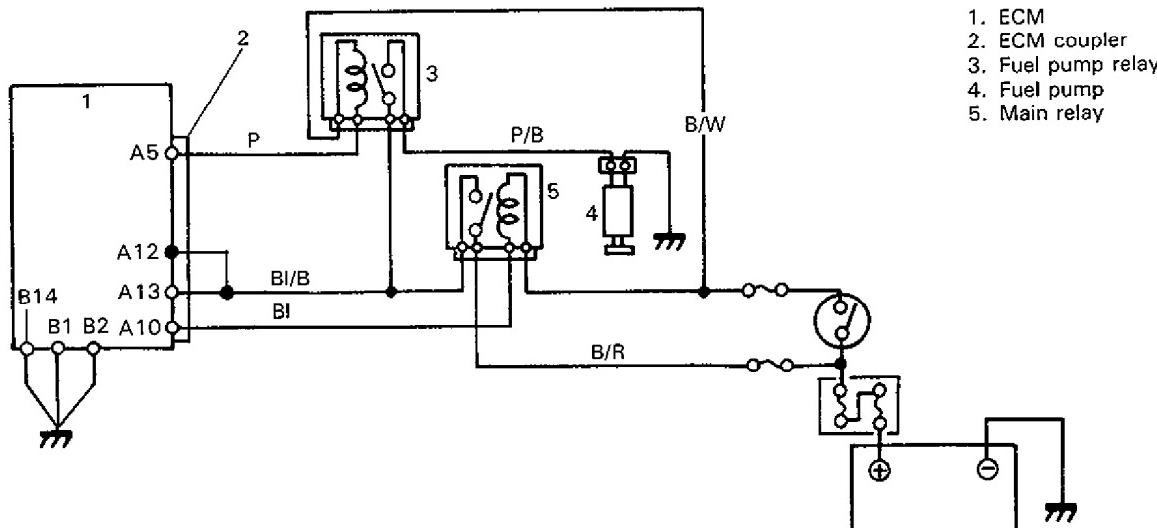
- With engine warmed up, if engine idle speed is high even when idle speed adjusting screw is tightened fully (in other words, if engine idle speed cannot be adjusted as specified with idle speed adjusting screw), check accelerator cable play, ISC solenoid valve control system and air valve in that order.
- If engine idle speed lowers below specification only when electric load is applied (e.g. headlight ON), check ISC solenoid valve control system first.
- With A/T model, if engine idle speed lowers below specification only when shifted to "R", "D", "2" or "L" range, check if "R", "D", "2" or "L" signal is inputted to ECM first.

Engine has no or poor power	<ul style="list-style-type: none"> • Maladjusted accelerator cable play • Vacuum leaks (or air inhaled) in air intake system • Maladjusted installation angle of TPS • Faulty EGR system (if equipped) • Fuel pressure out of specification • Faulty injector (s) • Poor performance of TPS, WTS, ATS or AFM • Faulty ECM • Maladjusted idle mixture (For vehicle without oxygen sensor) 	<p>Check if throttle valve opens fully when accelerator pedal is depressed fully.</p> <p>See p. 6E1-92</p> <p>Diagnostic Flow Chart B-5</p> <p>Diagnostic Flow Chart B-3</p> <p>See p. 6E1-85</p> <p>See p. 6E1-92, 6E1-94, 6E1-91 or 6E1-90</p> <p>See p. 6E1-67</p> <p>See p. 6E1-76</p>
Engine hesitates when accelerating	<ul style="list-style-type: none"> • Vacuum leaks (or air inhaled) in air intake system • Faulty idle switch in TPS • Faulty EGR system (if equipped) • Fuel pressure out of specification • Faulty injector(s) • Poor performance of TPS, WTS, ATS or AFM • Faulty ECM • Maladjusted idle mixture (For vehicle without oxygen sensor) 	<p>See p. 6E1-92</p> <p>Diagnostic Flow Chart B-5</p> <p>Diagnostic Flow Chart B-3</p> <p>See p. 6E1-85</p> <p>See p. 6E1-92, 6E1-94, 6E1-91 or 6E1-90</p> <p>See p. 6E1-67</p> <p>See p. 6E1-76</p>

SYMPTOM	POSSIBLE CAUSE	INSPECTION
Surges (Variation in vehicle speed is felt although accelerator pedal is not operated)	<ul style="list-style-type: none"> Faulty EGR system (if equipped) Variable fuel pressure (clogged fuel filter, faulty fuel pressure regulator, etc.) Poor performance of AFM Faulty injector(s) Faulty ECM 	Diagnostic Flow Chart B-5 Diagnostic Flow Chart B-3 See p. 6E1-90 See p. 6E1-85 See p. 6E1-67
Poor gasoline mileage	<ul style="list-style-type: none"> High idle speed Fuel pressure out of specification or fuel leakage Poor performance of TPS, WTS or AFM Faulty EGR system (if equipped) Faulty injector(s) Faulty ECM Maladjusted idle mixture (For vehicle without oxygen sensor) 	Refer to item "Improper engine idle speed" previously outlined. Diagnostic Flow Chart B-3 See p. 6E1-92, 6E1-94 or 6E1-90 Diagnostic Flow Chart B-5 See p. 6E1-85 See p. 6E1-67 See p. 6E1-76
Excessive hydro-carbon (HC) emission (Applicable to oxygen sensor equipped vehicle only)	<ul style="list-style-type: none"> Engine not at normal operating temperature Clogged air cleaner Faulty ignition system Low compression Lead contamination of catalytic converter Fuel pressure out of specification A/F feed back compensation fails —Poor performance of AFM, TPS or WTS Faulty injector(s) Faulty ECM Maladjusted idle mixture (For vehicle without oxygen sensor) 	See Section 6F1. See Section 6 Check for absence of filler neck restrictor. Diagnostic Flow Chart B-3 See p. 6E1-90, 6E1-92 or 6E1-94 See p. 6E1-85 See p. 6E1-67 See p. 6E1-76
Excessive carbon monoxide (CO) (Applicable to oxygen sensor equipped vehicle only)	<ul style="list-style-type: none"> Engine not at normal operating temperature Clogged air cleaner Faulty ignition system Low compression Lead contamination of catalytic converter Fuel pressure out of specification A/F feed back compensation fails —Poor performance of AFM, TPS or WTS Faulty injector(s) Faulty ECM Maladjusted idle mixture (For vehicle without oxygen sensor) 	See Section 6F1. See Section 6 Check for absence of filler neck restrictor Diagnostic Flow Chart B-3 See p. 6E1-90, 6E1-92 or 6E1-94 See p. 6E1-85 See p. 6E1-67 See p. 6E1-76

SYMPTOM	POSSIBLE CAUSE	INSPECTION
Excessive nitrogen oxides (NOx) emission (Applicable to oxygen sensor equipped vehicle only)	<ul style="list-style-type: none"> • Vacuum leaks (or air inhaled) in air intake system • Improper ignition timing • Lead contamination of catalytic converter • Faulty EGR system (if equipped) • Fuel pressure out of specification • A/F feed back compensation fails —Poor performance of AFM, TPS or WTS • Faulty injector(s) • Faulty ECM • Maladjusted idle mixture (For vehicle without oxygen sensor) 	<p>See Section 6F1, Check for absence of filler neck restrictor Diagnostic Flow Chart B-5 Diagnostic Flow Chart B-3</p> <p>See p. 6E1-90, 6E1-92 or 6E1-94 See p. 6E1-85 See p. 6E1-67 See p. 6E1-76</p>

B-1 FUEL PUMP CIRCUIT CHECK



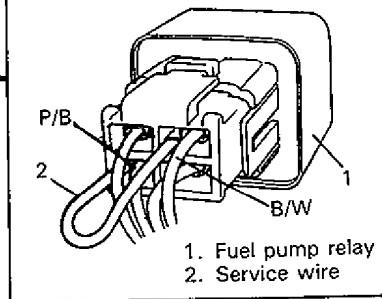
Is fuel pump heard to operate for 2 sec. after ignition switch ON?

NO

1. Turn OFF ignition switch.
2. Using service wire, connect "P/B" and "B/W" wire terminals.
3. Is fuel pump heard to operate at ignition switch ON?

YES

Fuel pump circuit in good condition.



YES

Check fuel pump relay referring to p. 6E1-98. Is it in good condition?

NO

"P/B" wire open, poor fuel pump coupler connection or faulty fuel pump.

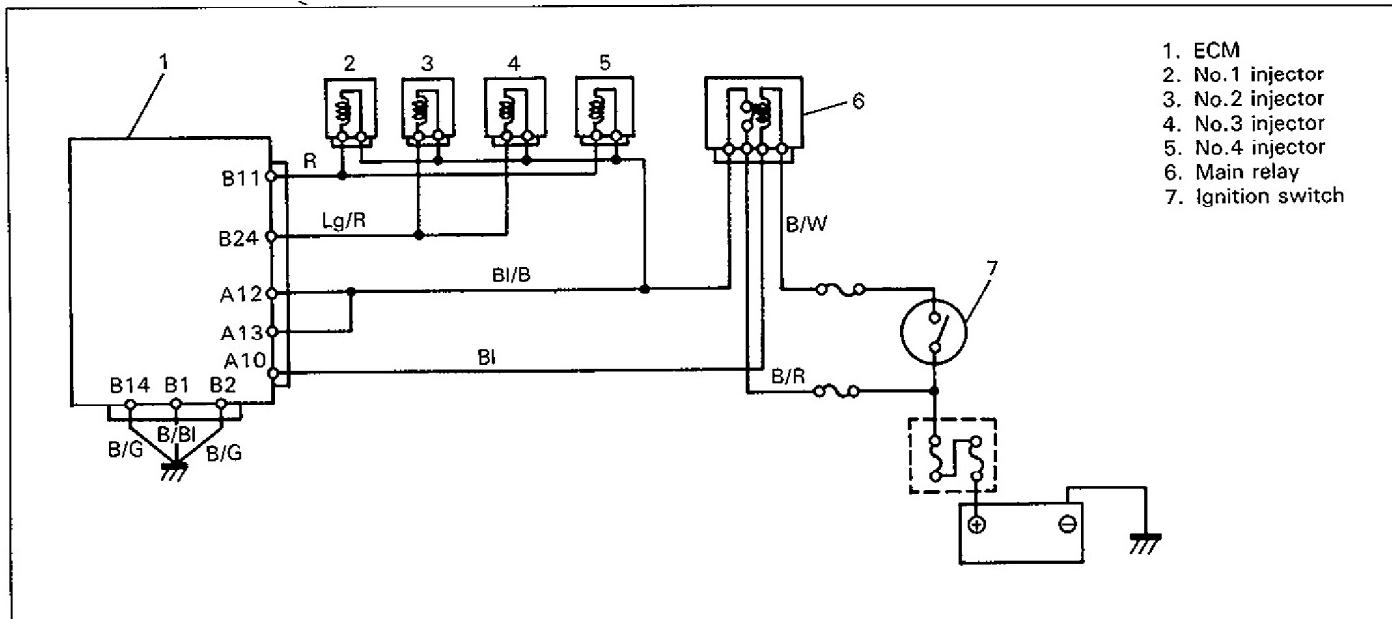
YES

Poor relay coupler connection, "P" wire open or poor A5 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

NO

Faulty fuel pump relay.

NOTE:
Before substituting a known-good ECM, check to make sure that resistance of coil in relay is as specified.

B-2 FUEL INJECTOR CIRCUIT CHECK

Using sound scope, check each injector for operating sound at engine cranking.
Do all 4 injectors make operating sound?

YES

Fuel injector circuit is in good condition.

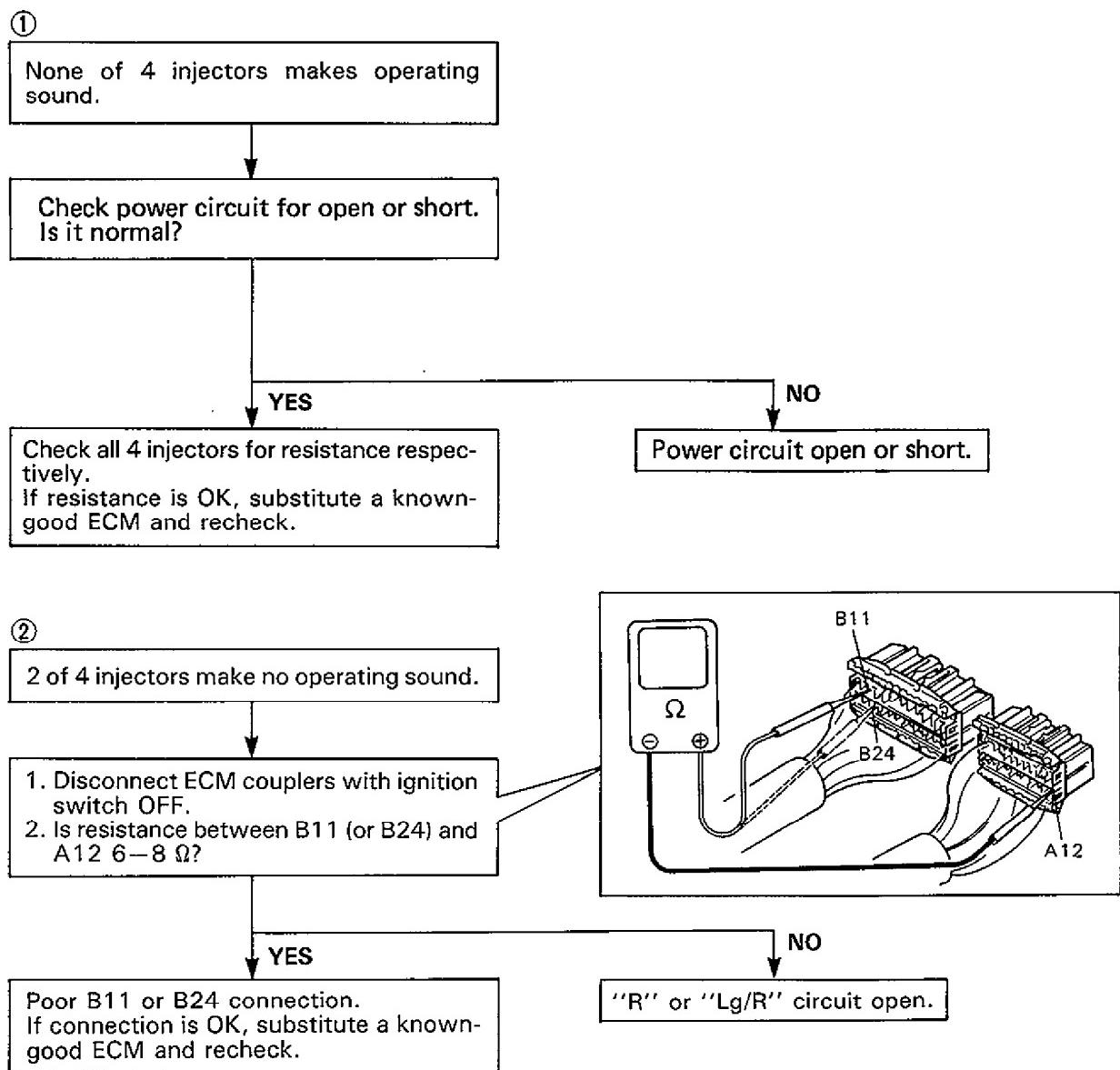
NO

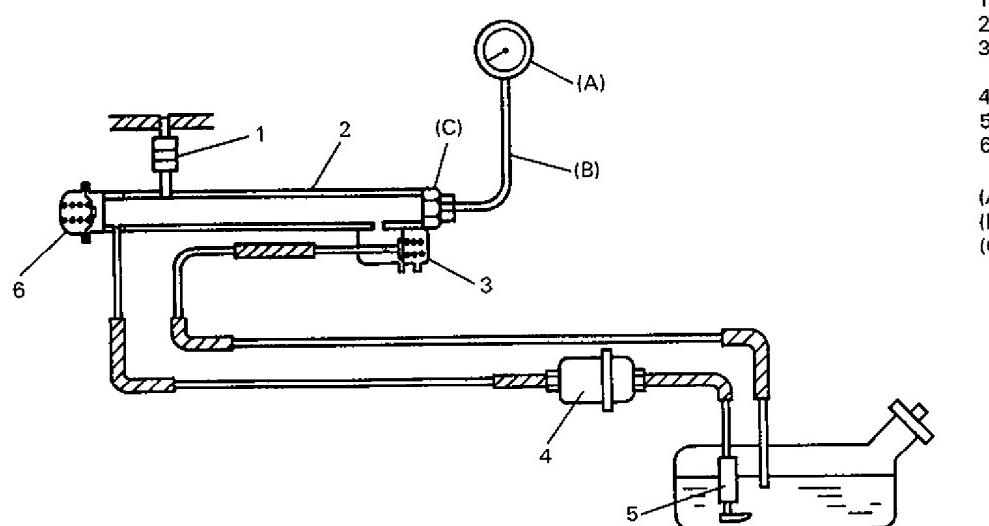
None of 4 injectors makes operating sound.
To ① on next page.

2 of 4 injectors make no operating sound.
To ② on next page.

One of 4 injectors makes no operating sound.

Check coupler connection of injector not making operating sound and injector itself (refer to p. 6E1-85.)



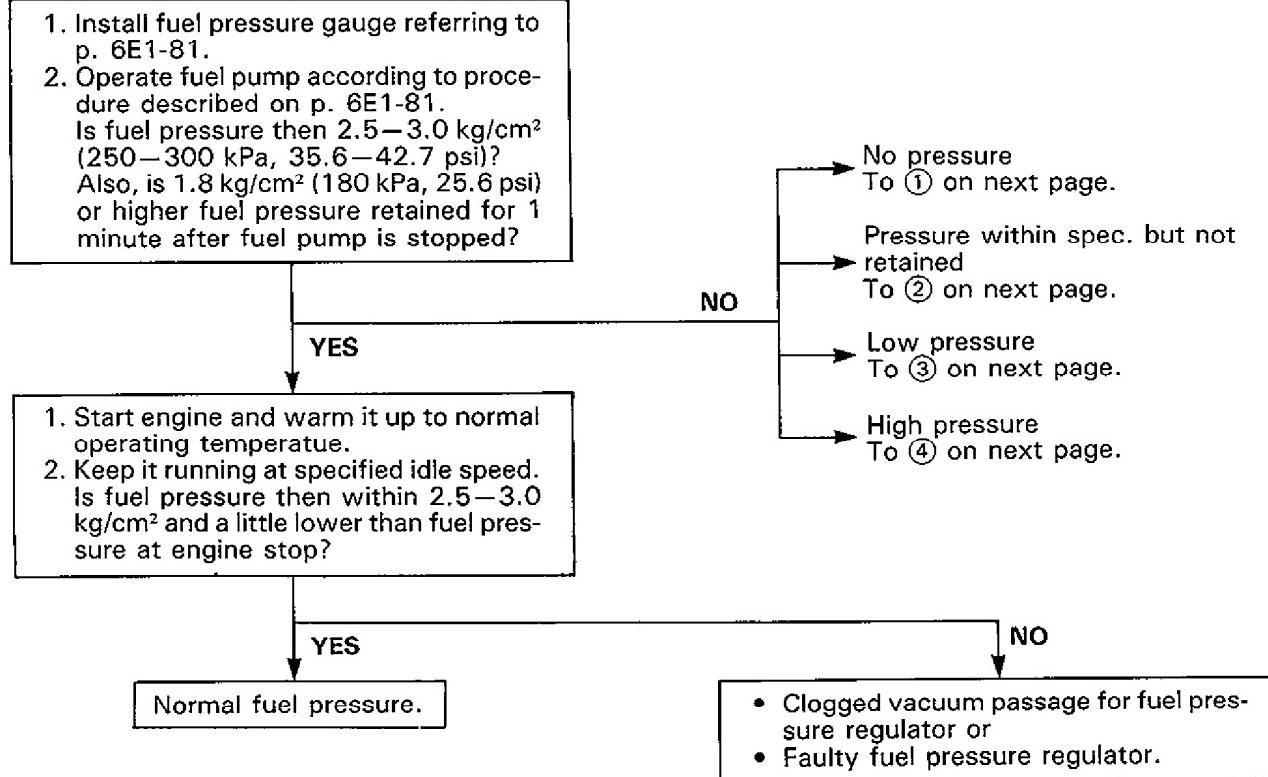
B-3 FUEL PRESSURE CHECK

1. Injector
2. Delivery pipe
3. Fuel pressure regulator
4. Fuel filter
5. Fuel pump
6. Pulsation damper

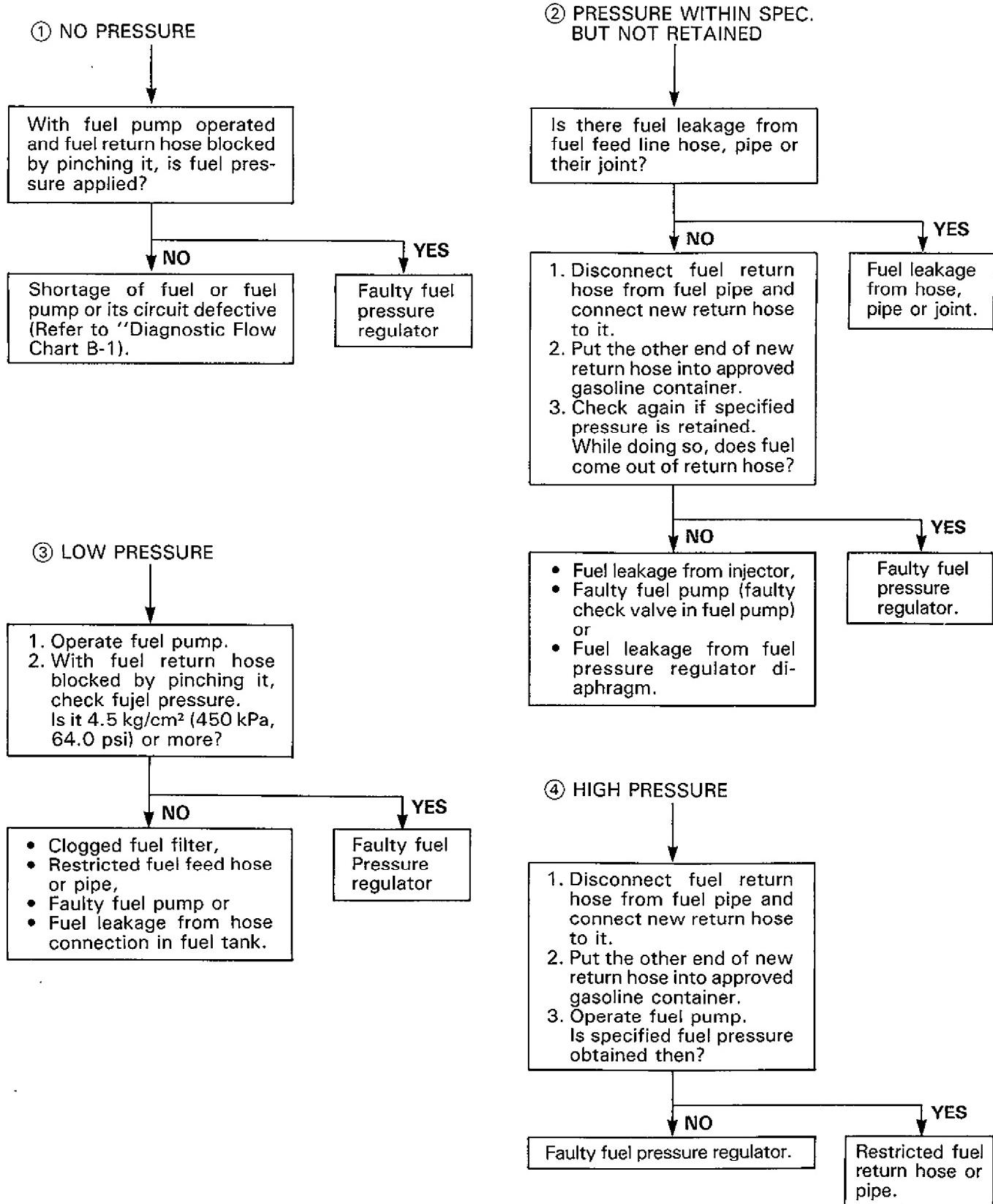
(A): Gauge
(B): Hose
(C): Attachment

NOTE:

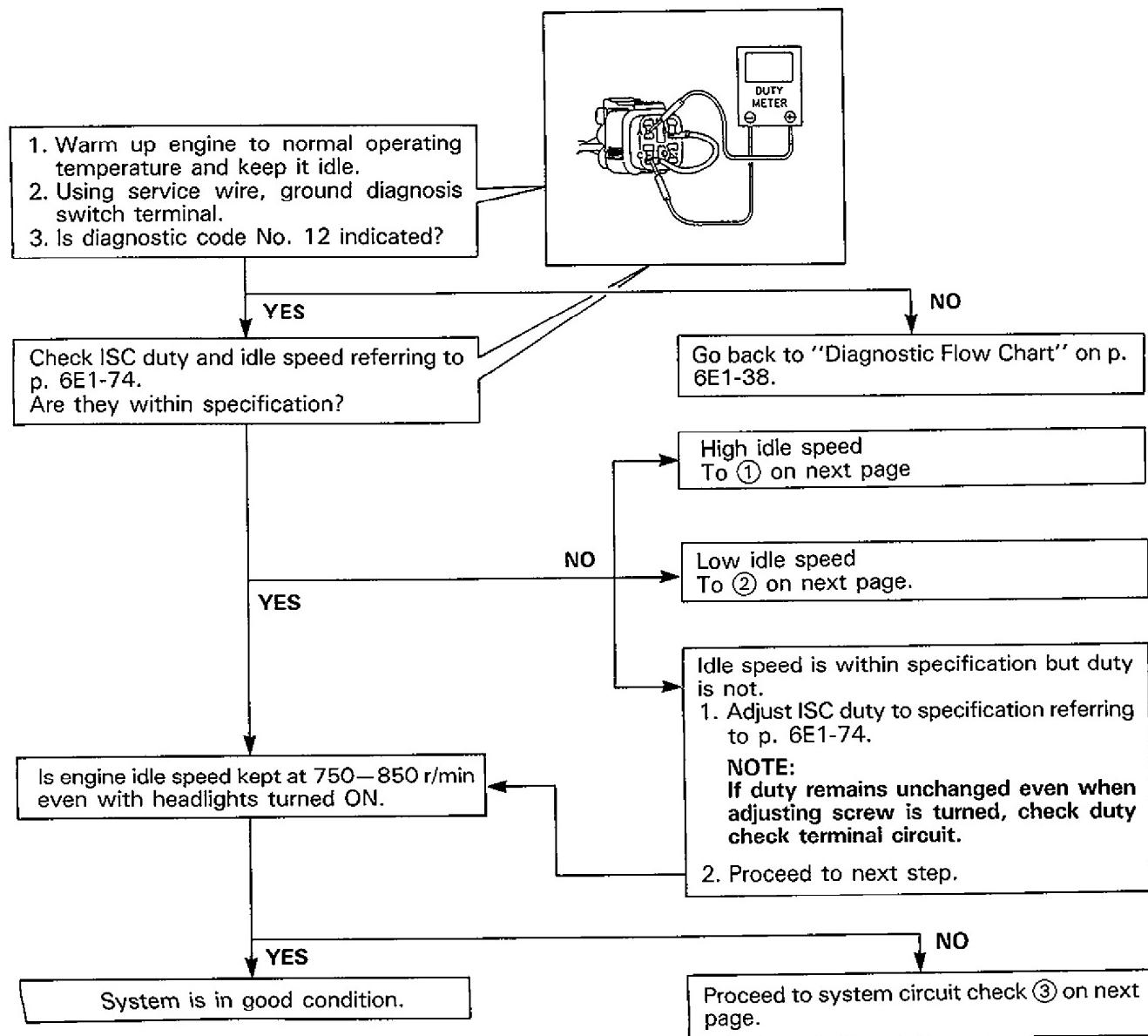
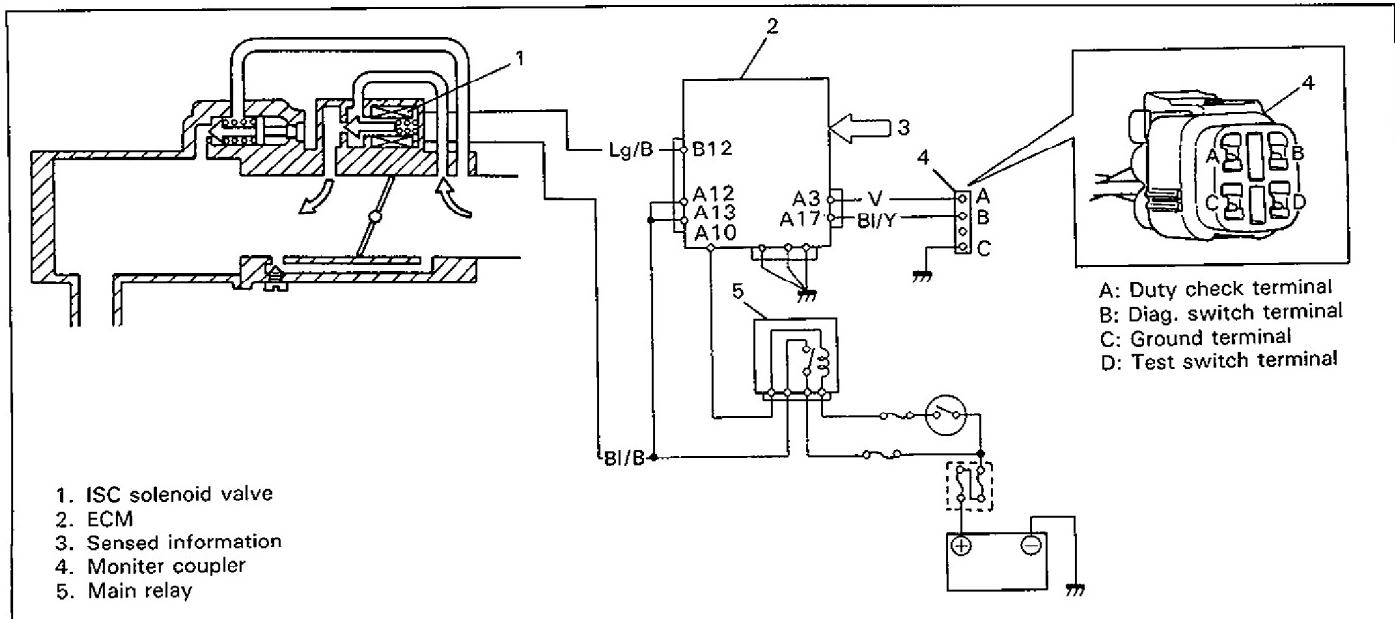
Before using following flow chart, check to make sure that battery voltage is higher than 11V. If battery voltage is low, pressure becomes lower than specification even if fuel pump and line are in good condition.



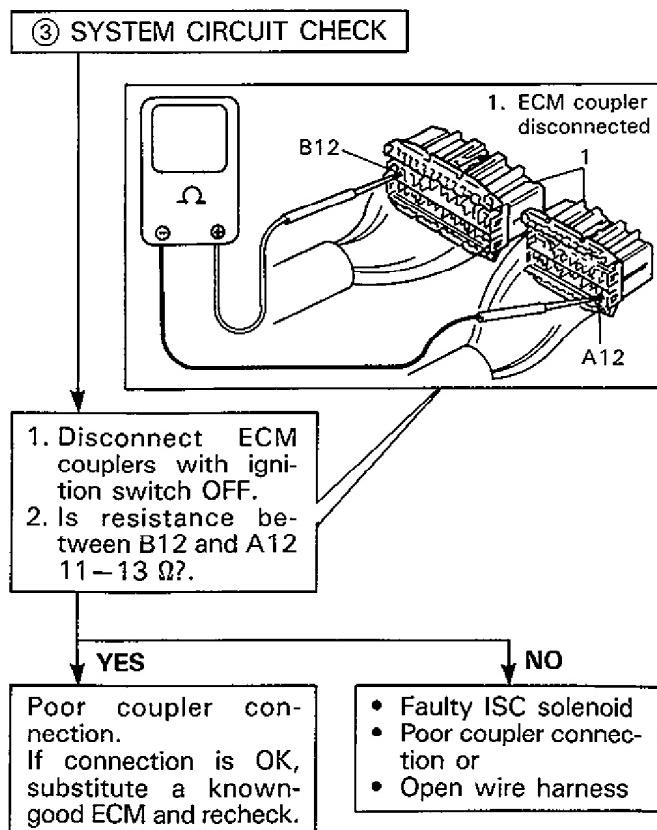
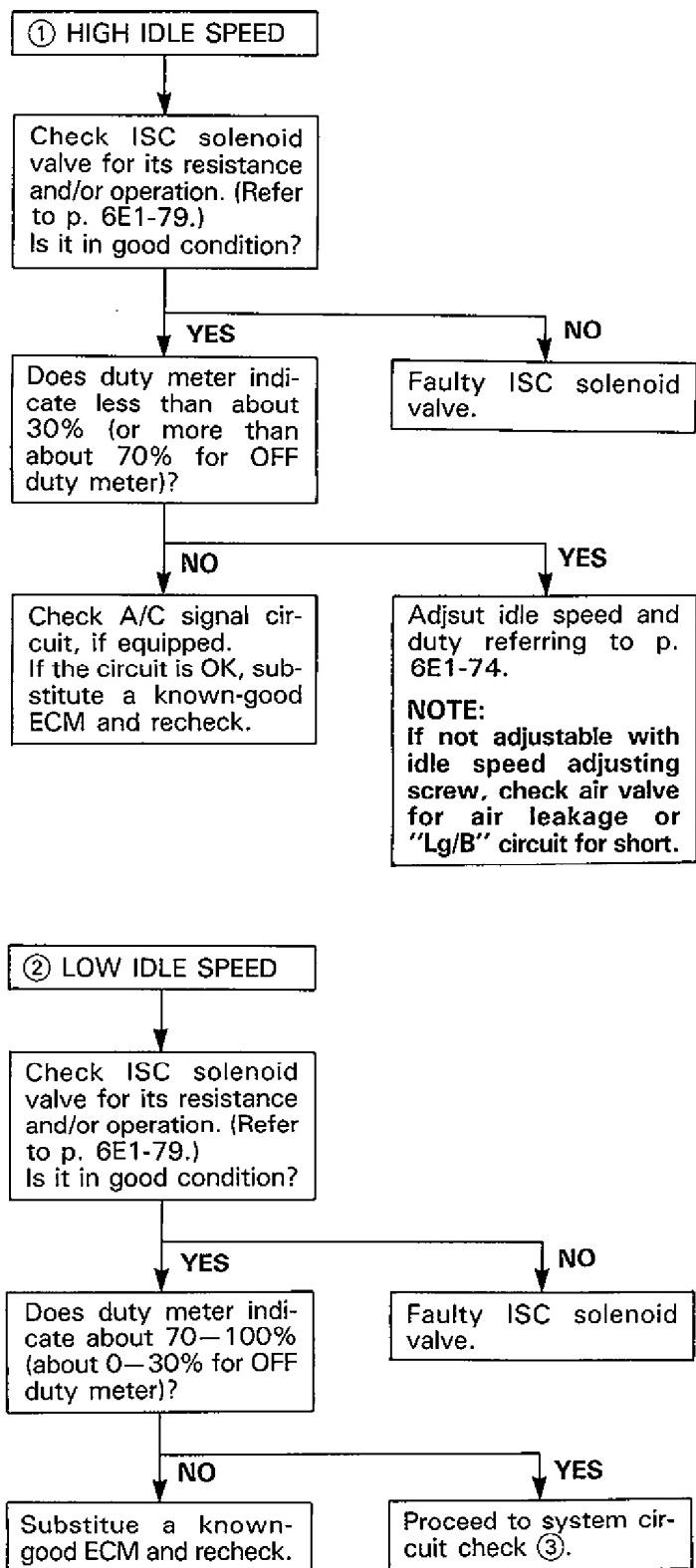
B-3 FUEL PRESSURE CHECK (continued)



B-4 ISC SOLENOID VALVE CONTROL SYSTEM CHECK



B-4 ISC SOLENOID VALVE CONTROL SYSTEM CHECK (continued)

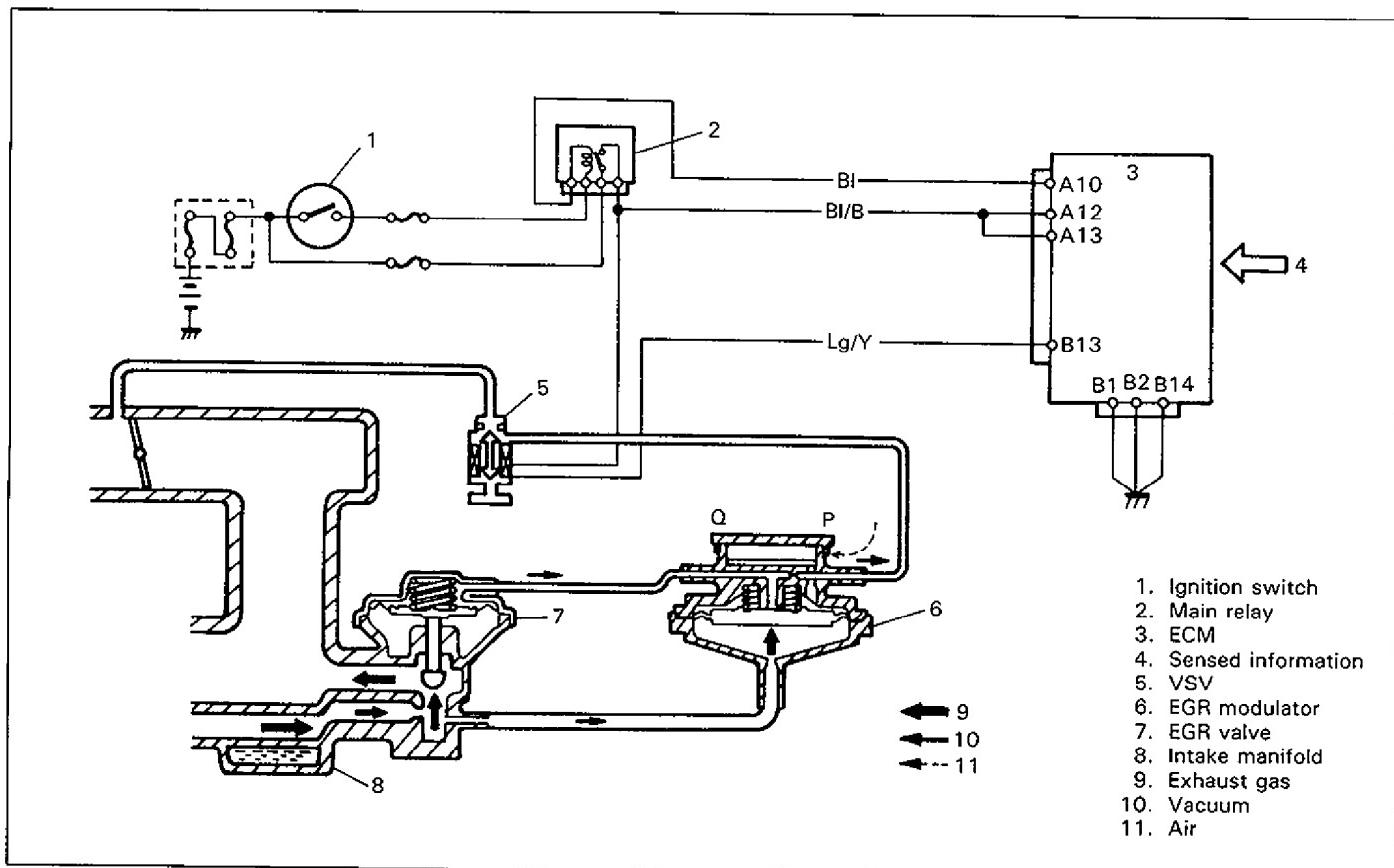


NOTE:
ISC duty can be checked by using analog type voltmeter, although not very accurate. ISC duty to voltage relation is as follows.

ON DUTY METER INDICATION	OFF DUTY METER INDICATION	VOLTMETER INDICATION
0 (%)	100 (%)	0 (V)
30	70	0.3 × VB
50	50	0.5 × VB
100	0	VB

- "OFF DUTY METER" is such duty meter that indicates approx. 100% when terminal voltage is approx. "0V".
- "VB" represents battery voltage while engine of vehicle being checked is running.

B-5 EGR SYSTEM CHECK



Check EGR system referring to p. 6E1-99.
 Is it in good condition?

NO

Check vacuum hose, EGR valve and EGR modulator referring to p. 6E1-99.
 Are they in good condition?

YES

EGR system in good condition.

YES

Check VSV referring to p. 6E1-101.
 Is it in good condition?

NO

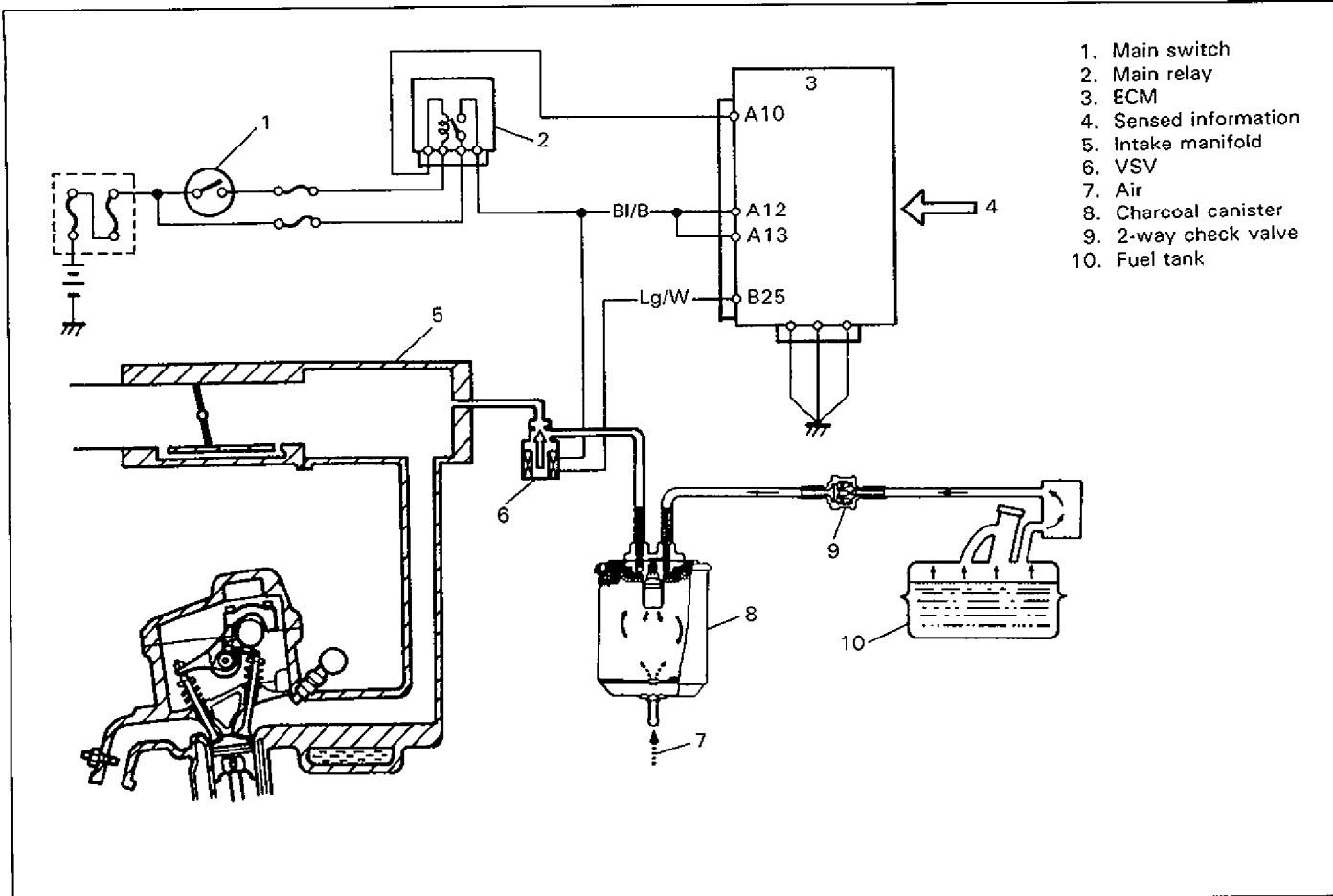
- Vacuum hose misconnection, leakage, clog or deterioration,
- Faulty EGR valve or
- Faulty EGR modulator.

YES

- "Lg/Y" wire open,
- "Lg/Y" wire shorted to ground,
- Poor VSV coupler connection
- Poor B13 connection or
- Poor performance of WTS
- If wire, connection and sensor are OK, substitute a known-good ECM and recheck.

Faulty VSV.

B-6 FUEL EVAPORATIVE EMISSION CONTROL SYSTEM CHECK



Check canister purge system for operation referring to p. 6E1-102.
Is it in good condition?

NO

Check vacuum passage, hoses and VSV referring to p. 6E1-102.
Are they in good condition?

YES

- "Lg/W" wire open,
- "Lg/W" wire shorted to ground,
- Poor VSV coupler connection,
- Poor B25 connection or
- Poor performance of WTS

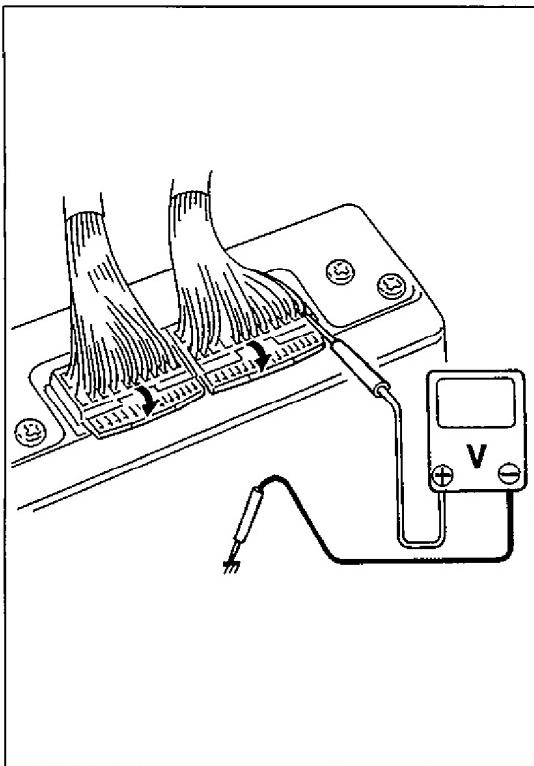
If wire, connection and sensor are OK, substitute a known-good ECM and recheck.

YES

- Canister purge system in good condition
check charcoal canister, 2-way check valve and fuel filler cap.

NO

- Vacuum passage clogged,
- Vacuum leakage or
- Faulty VSV



60A50-6E1-67-1S

INSPECTION OF ECM AND ITS CIRCUITS

ECM and its circuits can be checked at ECM wiring couplers by measuring voltage and resistance.

CAUTION:

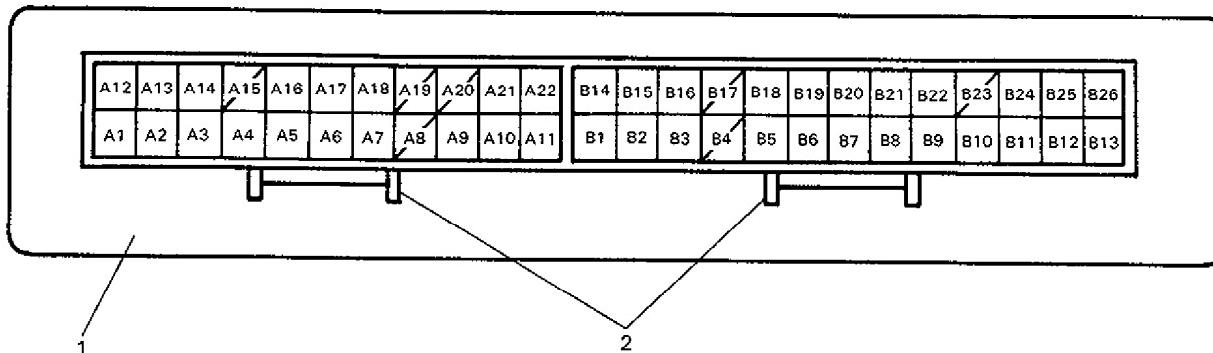
ECM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to ECM with couplers disconnected from it.

Voltage Check

1. Remove ECM from body referring to p. 6E1-89.
2. Connect ECM couplers to ECM.
3. Check voltage at each terminal of couplers connected.

NOTE:

As each terminal voltage is affected by the battery voltage, confirm that it is 11V or more when ignition switch is ON.



1. ECM
2. ECM coupler

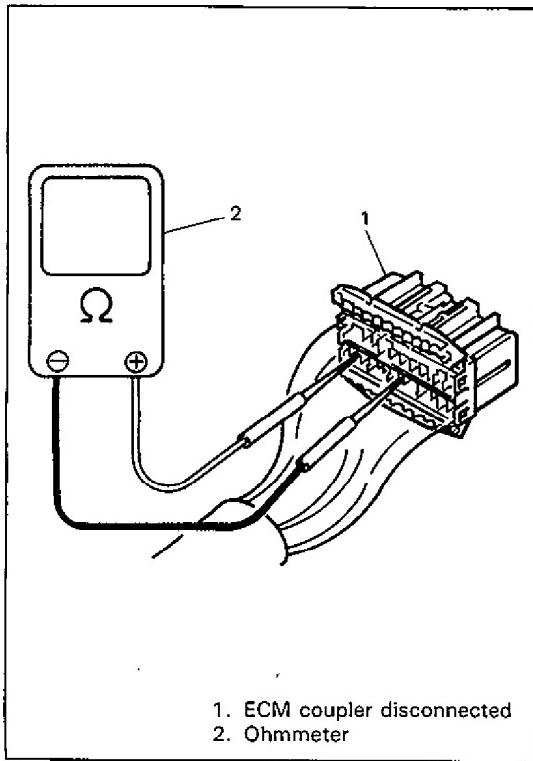
60A50-6E1-67-3S

TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A1	Power source for back-up circuit	10—14V	Ignition switch ON and OFF
A2	Engine start switch (Engine start signal)	6—12V	While engine cranking
		0V	Other than above
A3	Duty check terminal	10—14V	Ignition switch ON
A4	Ignition trigger signal	0—1V	Ignition switch ON
		Between 0—1 and 4—5V	While engine cranking
A5	Fuel pump relay	0—1V	For 2 seconds after ignition switch ON
		10—14V	After the above time
A6	Test switch terminal	10—14V	Ignition switch ON
		0V	Ignition switch ON Test switch terminal grounded
A7	VSS	Indicator deflection repeated between 0V and 4—5V	Ignition switch ON Rear left tire turned slowly with rear right tire locked
A8	Blank	—	—
A9	Air-conditioner circuit (if equipped)	10—14V	Ignition switch ON
		0—1V	With engine running Air-conditioner ON
A10	Main relay	0—1V	Ignition switch ON
A11	Electric load switch	0V	Ignition switch ON Headlight, small light, heater fan and rear window defogger all turned OFF
		10—14V	Ignition switch ON Headlight, small light, heater fan or rear window defogger turned ON
A12 A13	Power source	10—14V	Ignition switch ON
A14	"CHECK ENGINE" light	0—1V	Ignition switch ON
		10—14V	Engine running
A15	Blank	—	—
A16 (A/T only)	A/T controller (Water temp. switch signal)	0—1V	Ignition switch ON Engine cooling water temp.: below 55°C (131°F)
		10—14V	Ignition switch ON Engine cooling water temp.: over 60°C (140°F)
A17	Diag. switch terminal	10—14V	Ignition switch ON
		0—1V	Ignition switch ON Diag. switch terminal grounded

TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A18	Idle switch (in TPS)	0–1V	Ignition switch ON Throttle valve at idle position
		10–14V	Ignition switch ON Throttle valve opens larger than idle position
A19	Power steering pressure switch (if equipped)	10–14V	Ignition switch ON
		0–1V	With engine running at idle speed, turning steering wheel to the right and left as far as it stops, repeating it a few times
A20 A21	Blank	—	—
A22 (A/T only)	Shift switch	0–1V	Ignition switch ON Selector lever in "P" or "N" range
		10–14V	Ignition switch ON Selector lever in "R", "D", "2" or "L" range
B1 B2	Ground	—	—
B3	CAS (positive)	—	—
B4	Blank	—	—
B5	Ignition fail safe signal	0–2V	Ignition switch ON
		Between 0–2V and 4–5V	While engine cranking
B6	Power source for sensors	4.75–5.25V	Ignition switch ON
B7	TPS	0.1–1V	Ignition switch ON Throttle valve at idle position
		3.3–4.5V	Ignition switch ON Throttle valve at full open position
B8	AFM	3.7–4.3V	Full close
		0.2–0.4V	Full open
B9	WTS	0.4–0.6V	Ignition switch ON Cooling water temp.: 80°C (176°F)
B10 (A/T only)	A/T controller (Throttle valve opening signal)		Ignition switch ON Voltage varies as specified at graph in p. 6E1-31 while throttle valve is opened gradually.
B11	Injector (No.1 & No.4)	10 – 14V	Ignition switch ON
B12	ISC solenoid valve	—	—
B13	EGR VSV (if equipped)	10–14V	Ignition switch ON

TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
B14	Ground	—	—
B15	Sensor ground	—	—
B16	CAS (negative)	—	—
B17	Blank	—	—
B18 (A/T only)	Ground	—	—
B19	Blank	—	—
B20	Oxygen sensor (if equipped)	Indicator deflection repeated between over and under 0.45V	While engine running at 2,000 r/min for 1 minute or longer after warmed up
B21	ATS (in AFM)	2.2—2.6V	Ignition switch ON Sensor ambient temp.: 20°C (68°F)
B22	Serial data terminal	4—5V	Ignition switch ON
B23	Blank	—	—
B24	Injector (No.2 & No.3)	10—14V	Ignition switch ON
B25	Canister purge VSV	10—14V	Ignition switch ON
B26	Oxygen sensor heater (if equipped)	10—14V	Ignition switch ON

60A50-6E1-70-1S



Resistance Check

1. Disconnect ECM couplers from ECM with ignition switch OFF.

CAUTION:

Never touch terminals of ECM itself or connect voltmeter or ohmmeter.

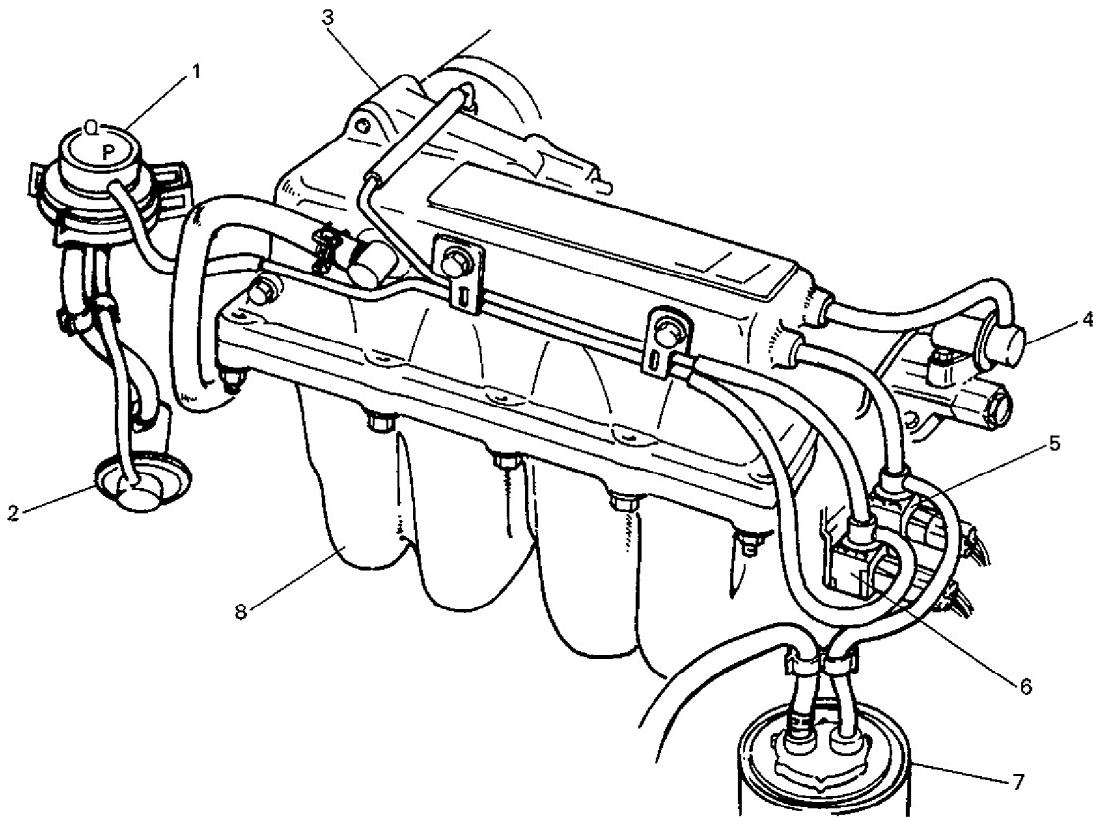
2. Check resistance between each pair of terminals of disconnected couplers as listed in following table.

CAUTION:

- Be sure to connect ohmmeter probe from wire harness side of coupler.
- Be sure to turn OFF ignition switch for this check.
- Resistance in table represents that when parts temperature is 20°C (68°F).

TERMINAL	CIRCUIT	STANDARD RESISTANCE	CONDITION	
A5 — A10	Main and fuel pump relay	124—153Ω	—	
A7 — Body ground	VSS	Ohmmeter indicator deflect between 0 and ∞	Rear left tire turned slowly with rear right tire locked	
A17— Body ground	Diag. switch terminal	∞ (infinity)	—	
A18— B15	Idle swtich	continuity	Throttle valve is at idle position	
		∞ (infinity)	Throttle valve opens larger than idle position	
A22— Body ground (A/T only)	Shift switch	continuity	Selector lever in "P" or "N" range	
		∞ (infinity)	Selector lever in "R", "D", "2" or "L" range	
B1 — Body ground	Ground	continuity	—	
B3 — B16	CAS	140—180Ω	—	
B7 — B15	TPS	0.3—6.3kΩ	Throttle valve at idle position	With AFM coupler disconnected
		3.5—10.3kΩ	Throttle valve at full open position	
B8 — B15	AFM	200—2000Ω	Measuring core at full closed position	With TPS coupler disconnected
		20—2000Ω	Measuring core at full open position	
B9 — B15	WTS	0.29—0.35kΩ	Engine cooling water temp. 80°C (176°F)	
B11— A12	Fuel injector (No.1 & 4)	6—8Ω	—	
B12— A12	ISC solenoid valve	11—13Ω	—	
B13— A12	EGR VSV (if equipped)	30—38Ω	—	
B14— Body ground	Ground	continuity	—	
B18— Body ground (A/T only)	Ground	continuity	—	
B21— B15	ATS	2.21—2.69kΩ	Sensor ambient temp. 20°C (68°F)	
B24— A12	Fuel injector (No.2 & 3)	6—8Ω	—	
B25— A12	Canister purge VSV	30—38Ω	—	
B26— A5	O ₂ sensor heater (if equipped) and fuel pump relay	67.7—99.5Ω	—	

ON VEHICLE SERVICE

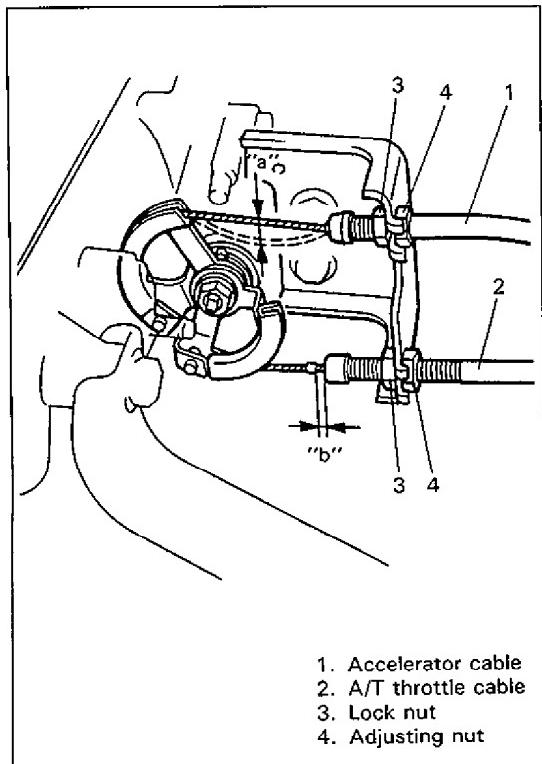


1. EGR modulator
(If equipped)
2. EGR valve
(If equipped)
3. Throttle body
4. Fuel pressure regulator
5. Canister purge VSV
6. EGR VSV (If equipped)
7. Charcoal canister
8. Intake manifold

GENERAL

When hoses are disconnected and system components are removed for service, reinstall components properly, and route and connect hoses correctly after service. Refer to previous figure for proper routing of hoses.

60A50-6E1-73-1S



60A50-6E1-73-2S

ACCELERATOR CABLE ADJUSTMENT

Check accelerator cable for play and adjust if necessary. Cable play should be within specification when accelerator pedal is released and engine is not running.

If not within specification, adjust by loosening lock nut. Be sure to tighten lock nut securely after adjustment.

Accelerator cable play "a": 3–5 mm (0.12–0.20 in.)

A/T THROTTLE CABLE ADJUSTMENT (A/T ONLY)

1. Make sure that accelerator cable play is within specification.
2. Check clearance "b", if it is out of specification. Adjust it by turning cable adjusting nut.

Clearance "b": 0.8–1.5 mm (0.03–0.06 in.)

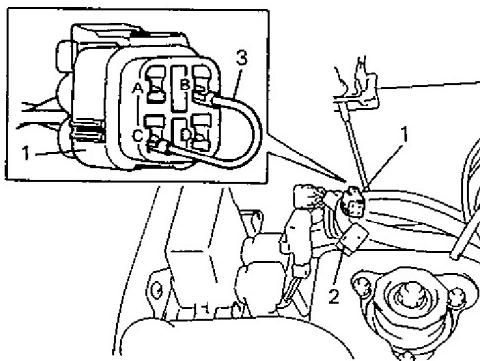
3. Tighten lock nut securely.

IDLE SPEED/ISC DUTY ADJUSTMENT

Before idle speed/ISC duty check and adjustment, make sure of the following.

- Lead wires and hoses of Electronic Fuel Injection and engine emission control systems are connected securely.
- Accelerator cable has some play, that is, it is not tight.
- Valve lash is checked and adjusted according to maintenance schedule.
- Ignition timing is within specification.
- All accessories (wipers, heater, lights, A/C, etc.) are out of service.
- Air cleaner has been properly installed and is in good condition.

60A50-6E1-74-1S



1. Monitor coupler
2. Cap
3. Service wire
- A: Duty check terminal
- B: Diagnosis switch terminal
- C: Ground terminal
- D: Test switch terminal

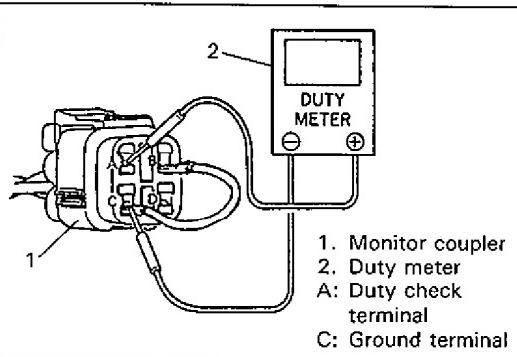
After above items are all confirmed, check idle speed and ISC duty as follows.

NOTE:

Before starting engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T vehicle), and set parking brake and block drive wheels.

1. Warm up engine to normal operating temperature.
2. Using service wire, ground diagnosis switch terminal in monitor coupler and make sure that "CHECK ENGINE" light indicate diagnostic code No.12.
The monitor coupler is located beside battery.

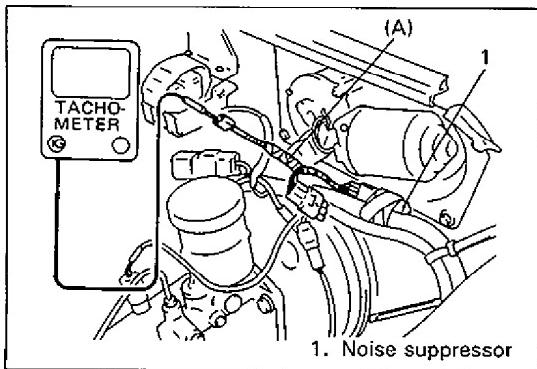
60A50-6E1-74-3S



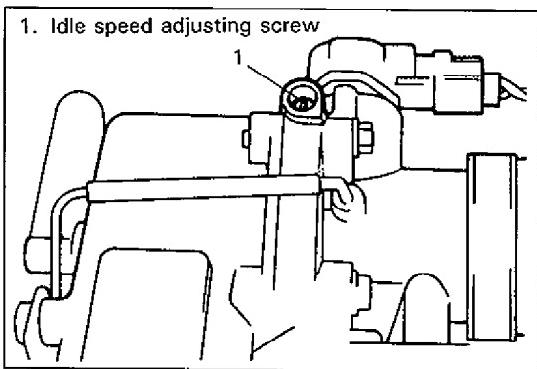
1. Monitor coupler
2. Duty meter
- A: Duty check terminal
- C: Ground terminal

3. Stop engine and connect duty meter between duty check terminal and ground terminal of monitor coupler.

60A50-6E1-74-5S



60A50-6E1-75-1S



60A50-6E1-75-2S

4. Disconnect noise suppressor coupler and connect special tool (Adapter wire) between suppressor and coupler disconnected. Set tachometer.

Special Tool

(A): 09931-96010

5. Start engine and warm it up completely.
6. Check ISC duty and idle speed. If duty and/or idle speed is out of specifications, adjust it by turning idle speed adjusting screw.

ENGINE IDLE SPEED AND ISC DUTY	
Engine idle speed	800 ± 50 r/min.
ISC duty at specified idle speed	50%

7. Upon completion of adjustment, install adjusting screw cap to throttle body.
8. Remove service wire from monitor coupler.
9. Install cap to monitor coupler.
10. Check that the specified engine idle speed is obtained with A/C ON if vehicle is equipped with A/C.
Refer to p. 6E1-28 for specified idle speed.
If not, check A/C ON signal circuit and ISC solenoid valve.

60A50-6E1-75-3S

IDLE MIXTURE ADJUSTMENT**(For vehicle without oxygen sensor)**

All vehicles not equipped with oxygen sensor are shipped with their CO% factory adjusted as follows.

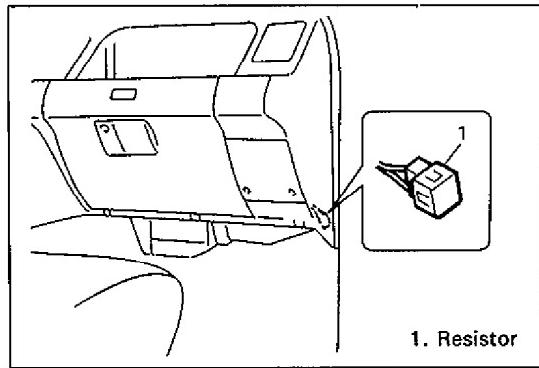
Engine idle mixture CO%	0.5 – 1.2
Engine idle speed (r/min)	800 ± 50
ISC duty at specified idle speed	50%

Idle mixture adjustment should never be changed from the original factory setting. However, if during diagnosis, the check indicates idle mixture to be the cause of a driver performance complaint or emission failure, the idle mixture can be adjusted using the following procedures.

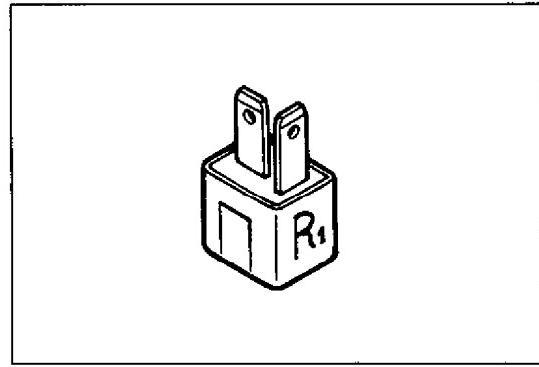
NOTE:

For this inspection and adjustment, exhaust gas tester (CO meter) and engine tachometer are necessary.

60A50-6E1-76-1S



60A50-6E1-76-3S



60A50-6E1-76-4S

1. Check and adjust idle speed according to "IDLE SPEED ADJUSTMENT" described above.
2. Using exhaust gas tester, check that idle mixture CO% is within above specification. If it is out of specification, adjust it to specification by replacing resistor.

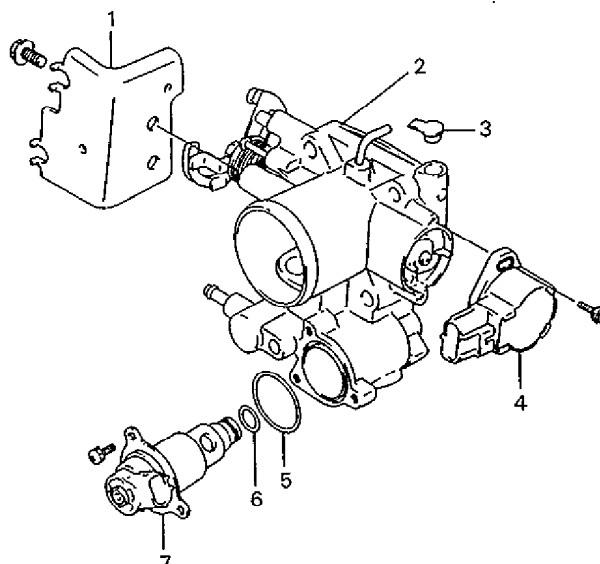
Available resistor

R_3 ,	R_2 ,	$\boxed{R_1}$,	L_1 ,	L_2 ,	L_3 ,
---------	---------	-----------------	---------	---------	---------

High resistance
A/F mixture becomes richer
CO% increases

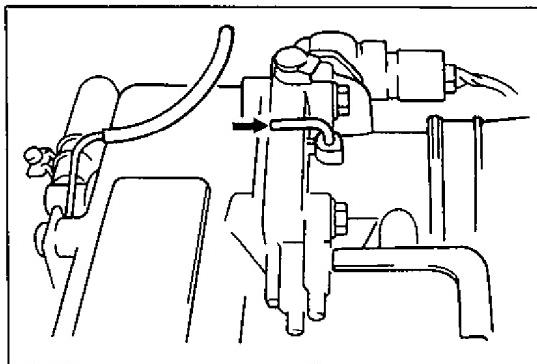
Low resistance
A/F mixture becomes leaner
CO% decreases

3. If idle mixture has been adjusted, readjust idle speed and ISC duty.
4. Repeat Step 2 and 3 to adjust idle mixture and idle speed as specified.

AIR INTAKE SYSTEM**THROTTLE BODY**

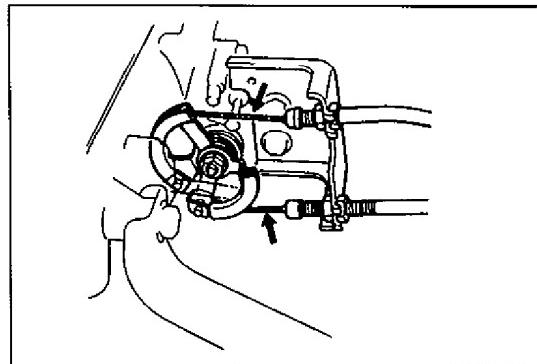
1. Cable bracket
 2. Throttle body
 3. Cap (plug)
 4. TPS
 5. O ring
 6. O ring
 7. ISC valve

60A50-6E1-77-1S

**On Vehicle Inspection**

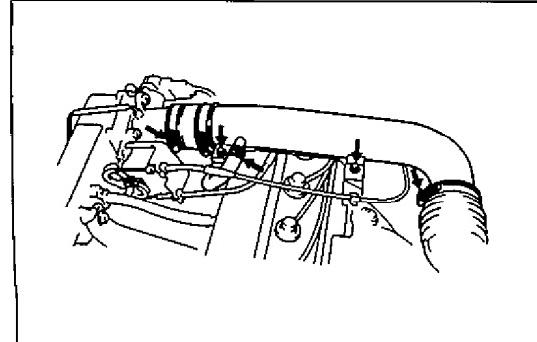
- Check that throttle valve lever moves smoothly.
- Vacuum passage inspection (if equipped)
With finger placed against vacuum nozzle, increase engine speed a little and check that vacuum is applied.

60A50-6E1-77-3S

**Removal**

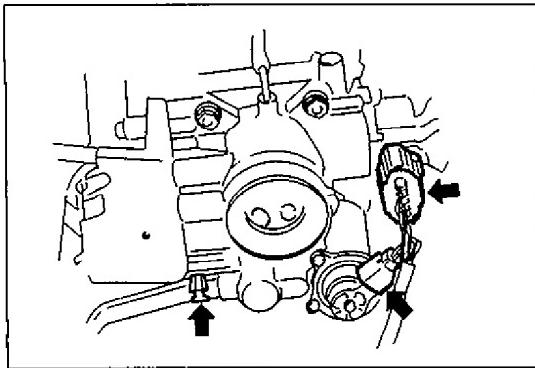
1. Disconnect negative cable at battery.
2. Drain cooling system.
3. Disconnect accelerator cable and A/T throttle cable (if equipped) from throttle body.

60A50-6E1-77-4S



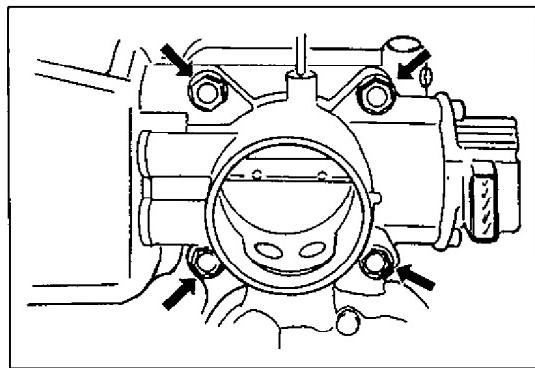
4. Remove air intake pipe and hose.

60A50-6E1-77-5S



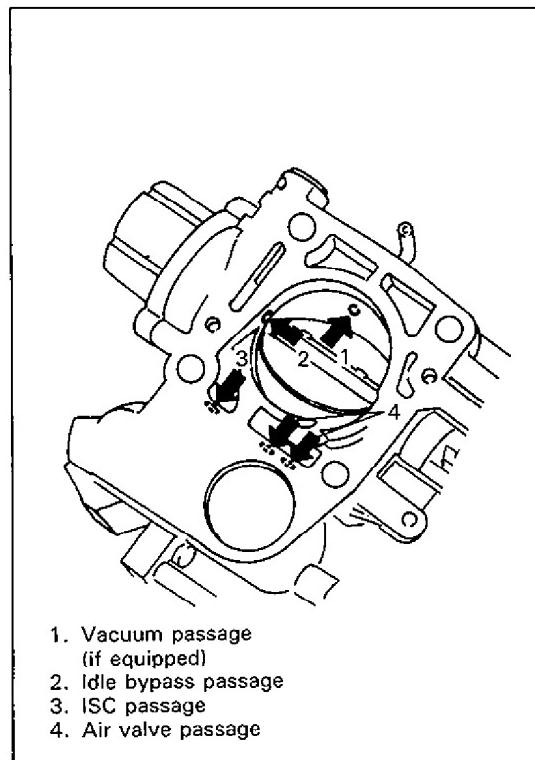
60A50-6E1-78-1S

5. Disconnect electric couplers, from TPS and ISC solenoid valve respectively.
6. Disconnect vacuum hose from throttle body, if equipped.
7. Disconnect cooling water hoses from throttle body.

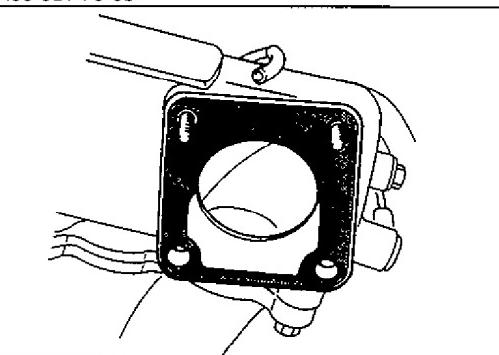


60A50-6E1-78-2S

8. Remove throttle body from surge tank (intake manifold).



60A50-6E1-78-3S



60A50-6E1-78-5S

Cleaning

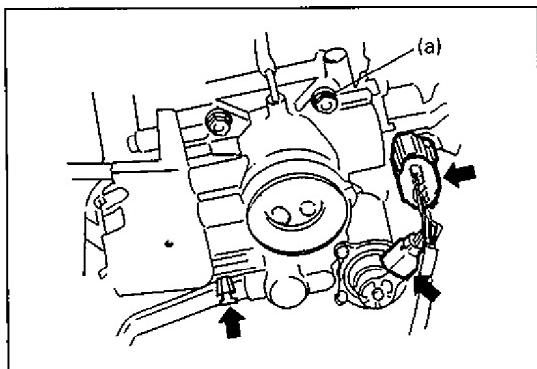
Clean passages by blowing compressed air.

NOTE:

- TPS, ISC solenoid valve or other components containing rubber must not be placed in a solvent or cleaner bath. A chemical reaction will cause these parts to swell, harden or get distorted.
- Don't put drills or wires into passages for cleaning. It causes damages in passages.

Installation

1. Clean mating surfaces and install throttle body gasket to surge tank. (intake manifold.)
Use new gasket.



60A50-6E1-79-1S

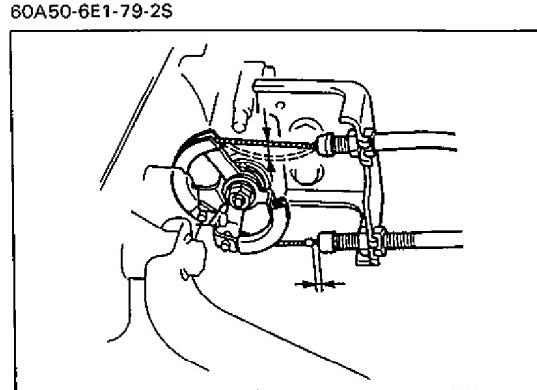
2. Install throttle body to surge tank and tighten bolts to specified torque.

Tightening Torque

(a): 18–28 N·m (1.8–2.8 kg·m, 13.5–20.0 lb·ft)

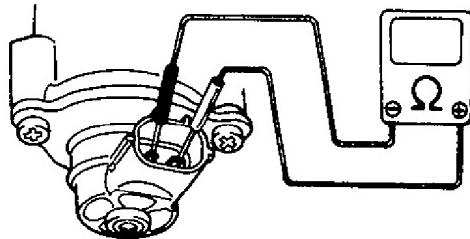
3. Connect cooling water hoses and vacuum hose (if equipped).
4. Connect couplers to TPS and ISC solenoid valve securely.

5. Install air intake pipe and hose.



60A50-6E1-79-2S

6. Connect accelerator cable and A/T throttle cable (if equipped), and adjust each cable play to specification.
7. Refill cooling system.
8. Connect negative cable at battery.



60A50-6E1-80-1S

ISC SOLENOID VALVE

On Vehicle Inspection

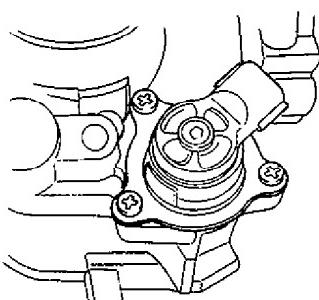
- With ignition switch "OFF", disconnect ISC solenoid valve coupler.
- Check resistance between each two terminals of ISC solenoid valve.

Resistance: 11—13Ω at 20°C, 68°F

If it is within specification, proceed to next operation check. If not, replace.

Removal

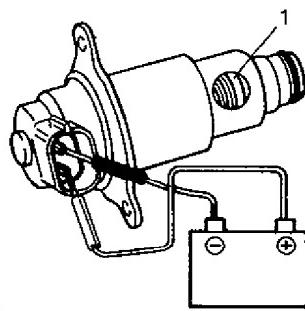
- Remove throttle body as previously outlined.
- Remove ISC solenoid valve from throttle body.



60A50-6E1-80-2S

Operation Check

- Check that no foreign matter is caught in valve.
- Check visually that valve opens only when 12V battery is connected to ISC solenoid valve terminals. Replace if any abnormality exists.

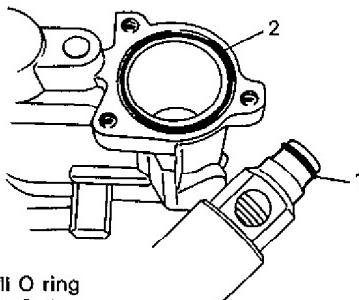


1. Valve

60A50-6E1-80-3S

Installation

- Check O rings for damage and deterioration and replace if necessary.



1. Small O ring
2. Large O ring

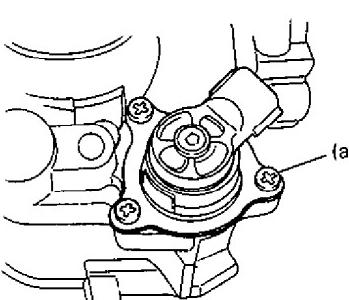
60A50-6E1-80-4S

- Install ISC solenoid valve and tighten screws to specified torque.

Tightening Torque

(a): 2.9—4.1 N·m (0.29—0.41 kg·m, 2.1—2.9 lb·ft)

- Install throttle body as previously outlined.



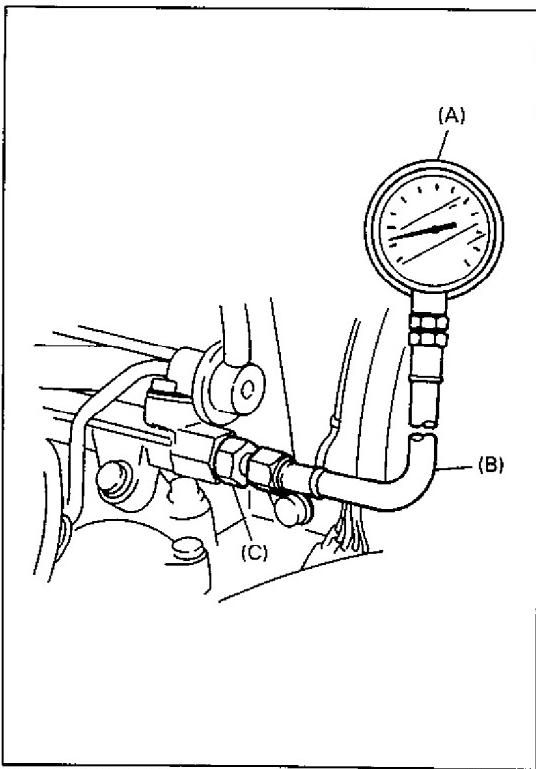
60A50-6E1-80-5S

FUEL DELIVERY SYSTEM

FUEL PRESSURE INSPECTION

1. Relieve fuel pressure in fuel feed line referring to p. 6-4.

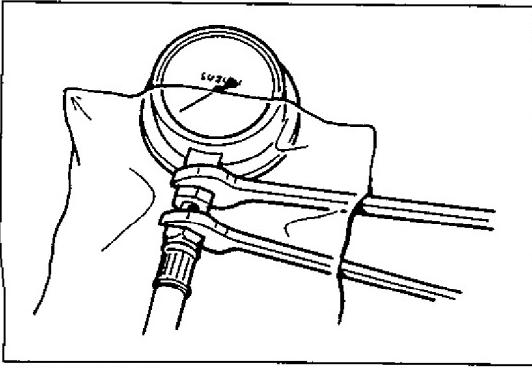
60A50-6E1-81-1S



60A50-6E1-81-2S

CONDITION	FUEL PRESSURE
At specified idle speed	2.5–3.0 kg/cm ² 250–300 kPa 35.6–42.7 psi
With fuel pump operating and engine stopped	
With 1 min. after engine (fuel pump) stop (Pressure reduces as time passes)	over 1.8 kg/cm ² 180 kPa 25.6 psi

60A50-6E1-81-4S



2. Remove plug bolt on fuel delivery pipe and connect special tools (fuel pressure gauge) to delivery pipe.

CAUTION:

A small amount of fuel may be released when plug bolt is loosened.

Place container under the bolt or cover bolt hole with a shop cloth so that released fuel is caught in container or absorbed in cloth. Place that cloth in an approved container.

Special Tool

(A) : 09912-58441

(B) : 09912-58431

(C) : 09919-46010

3. Check that battery voltage is above 11V.
4. Turn ignition switch ON to operate fuel pump and after 2 seconds turn it OFF. Repeat this 3 or 4 times and then check fuel pressure.
5. Start engine.
6. Measure fuel pressure at idling.

If measured pressure doesn't satisfy specification, refer to "Diagnostic Flow Chart B-3" and check each possibly defective part. Replace if found defective.

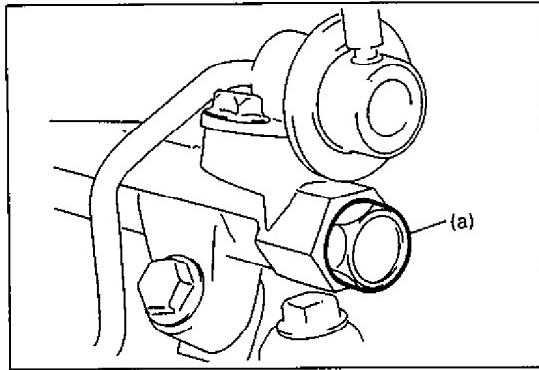
7. After checking fuel pressure, remove fuel pressure gauge.

CAUTION:

As fuel feed line is still under high fuel pressure, make sure to release fuel pressure according to following procedures.

- Place fuel container under joint.
- Cover joint with rag and loosen joint nut slowly to release fuel pressure gradually.

60A50-6E1-81-5S



60A50-6E1-82-1S

8. Install plug bolt to fuel delivery pipe.

Use new gasket.

Tighten it to specified torque.

Tightening Torque

(a): 45—55 N·m (4.5—5.5 kg·m, 33.0—39.5 lb·ft)

9. With engine "OFF" and ignition switch "ON", check for fuel leaks.

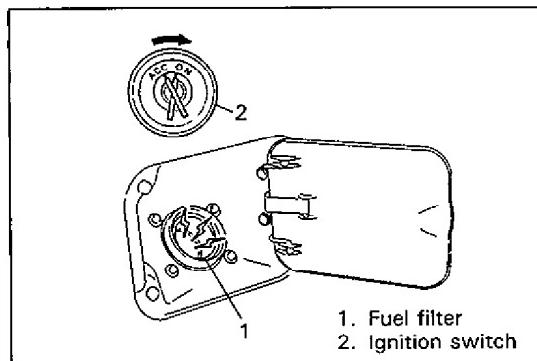
FUEL PUMP

On Vehicle Inspection

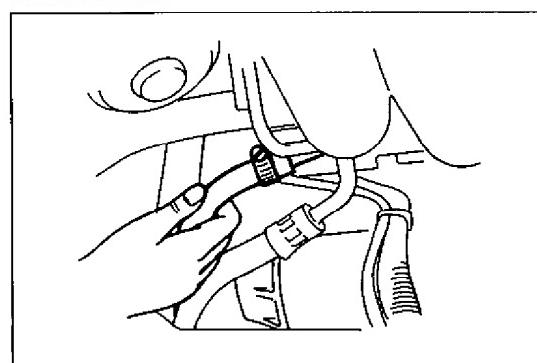
CAUTION:

When fuel filler cap is removed in any procedure, work must be done with no smoking, in a well-ventilated area and away from any open flames.

60A50-6E1-82-2S



60A50-6E1-82-3S



60A50-6E1-82-4S

1. Remove filler cap and turn ON ignition switch. Then fuel pump operating sound should be heard from fuel filler for about 2 seconds and stop. Be sure to reinstall fuel filler cap after checking.

If above check result is not satisfactory, advance to "Diagnostic Flow Chart B-1".

2. Fuel pressure should be felt at fuel return hose for 2 seconds after ignition switch ON.

If fuel pressure is not felt, advance to "Diagnostic Flow Chart B-3".

Removal

1. Remove fuel tank from body according to procedure described in section 6C and remove fuel pump from fuel tank.

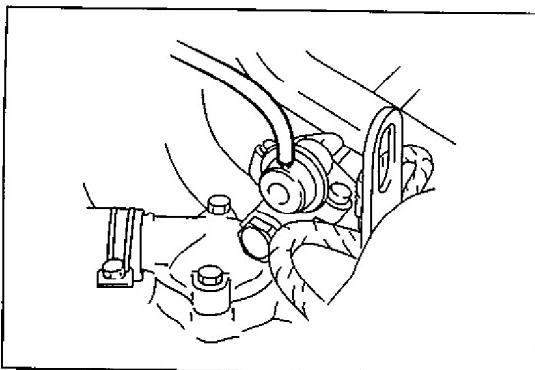
Inspection

Check fuel pump filter for evidence of dirt and contamination. If present, clean and check for presence of dirt in fuel tank.

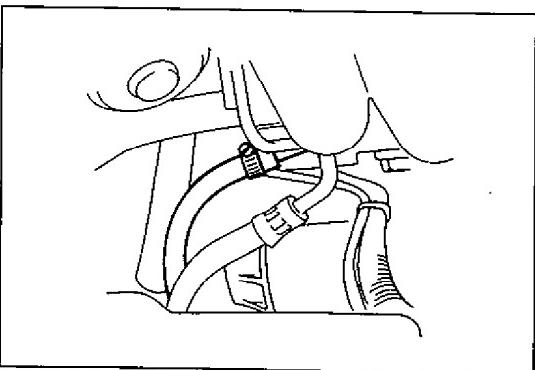
Installation

1. Install fuel pump to its bracket.
2. Install fuel pump to fuel tank and then install fuel tank to body according to procedure described in section 6C.

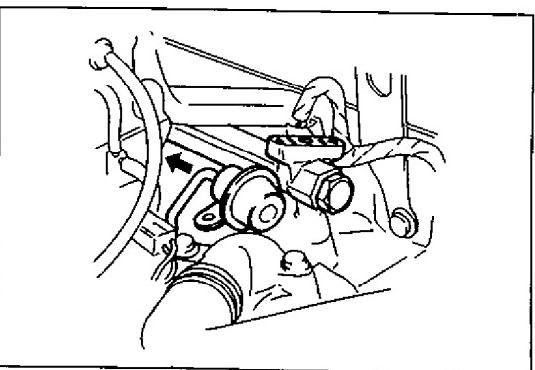
60A50-6E1-83-1S



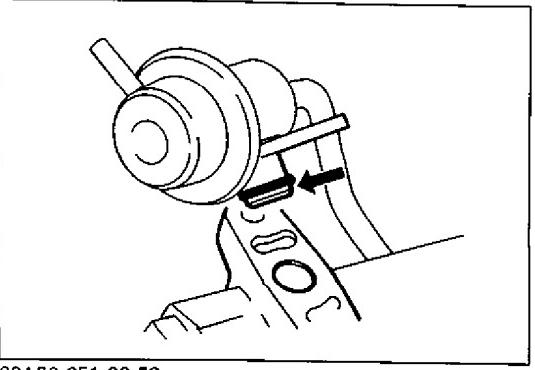
60A50-6E1-83-2S



60A50-6E1-83-3S



60A50-6E1-83-4S



FUEL PRESSURE REGULATOR

Removal

1. Relieve fuel pressure according to procedure described on p. 6-4.
2. Disconnect battery negative cable from battery.
3. Disconnect vacuum hose from fuel pressure regulator.

4. Disconnect fuel return hose from pipe.

CAUTION:

A small amount of fuel may be released when hose is disconnected. Cover hose to be disconnected with a shop cloth.

5. Remove pipe clamp bolts.

6. Remove fuel pressure regulator with return pipe rearwards.

CAUTION:

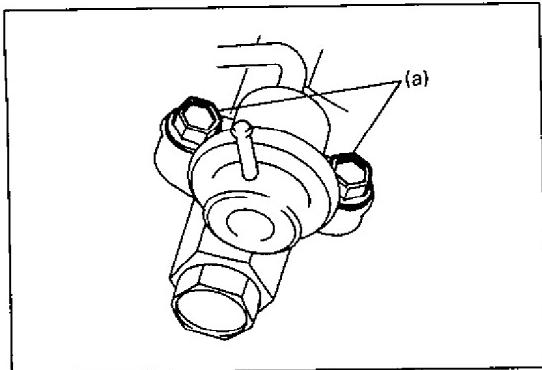
A small amount of fuel may be released when it is removed from delivery pipe.
Place a shop cloth under delivery pipe so that released fuel is absorbed in it.

Installation

For installation, reverse removal procedure and note following precautions.

- Use new O ring.
- Apply thin coat of spindle oil or gasoline to O ring to facilitate installation.

60A50-6E1-83-5S



60A50-6E1-84-1S

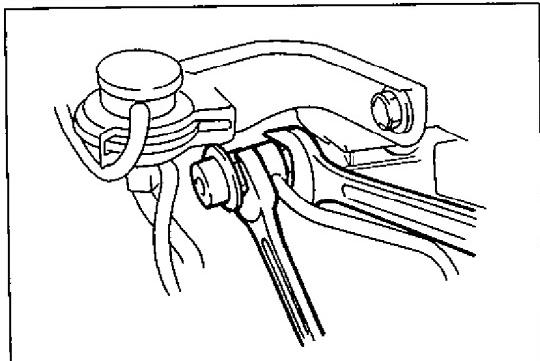
- Tighten fuel pressure regulator bolts to specified torque.

Tightening Torque

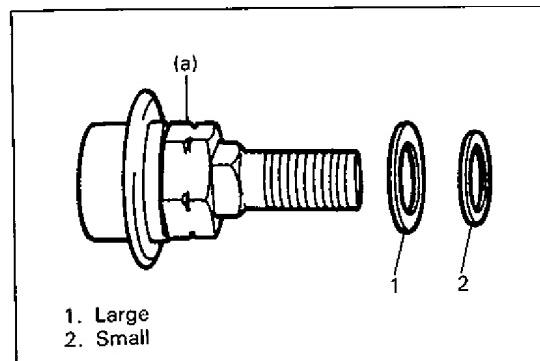
(a): 8–12 N·m (0.8–1.2 kg·m, 6.0–8.5 lb·ft)

- With engine “OFF” and ignition switch “ON”, check for fuel leaks around fuel line connection.

60A50-6E1-84-2S



60A50-6E1-84-3S



60A50-6E1-84-4S

4. Remove damper from delivery pipe.
Use backup wrench when loosening.

CAUTION:

A small amount of fuel may be released after it is removed. Cover feed pipe with a shop cloth.

Installation

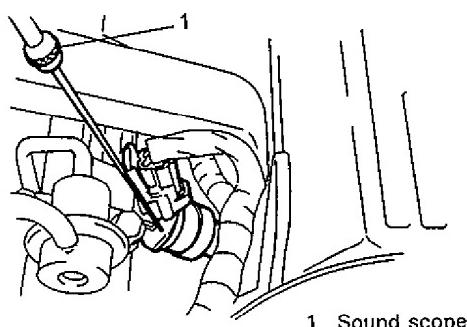
For installation, reverse removal procedure and note following precautions.

- Make sure to use new gaskets and apply thin coat of engine oil to them.
- Using backup wrench, tighten damper to specified torque.

Tightening Torque

(a): 25–35 N·m (2.5–3.5 kg·m, 18.5–25.0 lb·ft)

- With engine “OFF” and ignition switch “ON”, check for fuel leaks around fuel line connection.



60A50-6E1-85-1S

FUEL INJECTOR

On-Vehicle Inspection

1. Using sound scope or such, check operating sound of injector when engine is running or cranking.

Cycle of operating sound should vary according to engine speed.

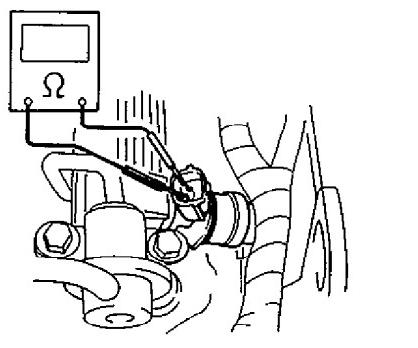
If no sound or an unusual sound is heard, check injector circuit (wire or coupler) or injector.

2. Disconnect coupler from injector, connect ohmmeter between terminals of injector and check resistance.

Resistance of injector: 12—16 Ω

If resistance is out of specification, replace.

3. Connect coupler to injector securely.



60A50-6E1-85-2S

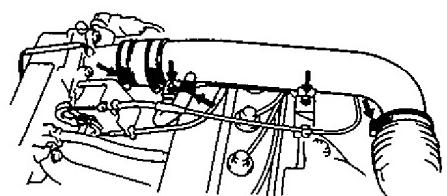
Removal

1. Relieve fuel pressure according to procedure described on p. 6-4.

2. Disconnect battery negative cable at battery.

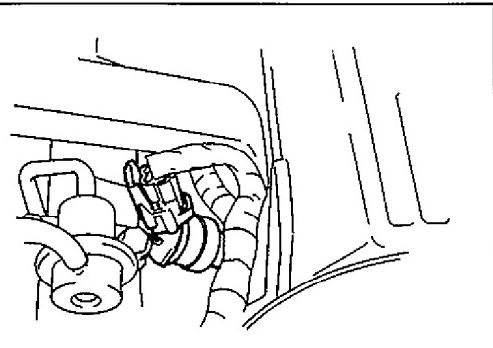
60A50-6E1-85-3S

3. Remove air intake pipe and hose.

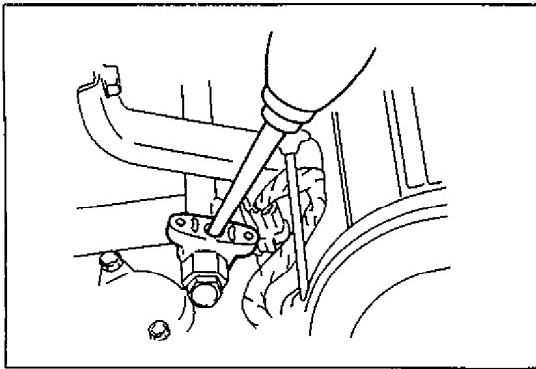


60A50-6E1-85-4S

4. Disconnect coupler from each injector.

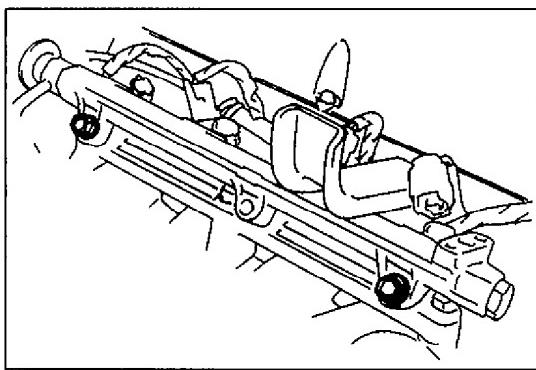


60A50-6E1-85-5S



60A50-6E1-86-1S

5. Remove fuel pressure regulator from delivery pipe as previously outlined and drain fuel delivery pipe.
6. Remove fuel feed pipe clamp bolt.



60A50-6E1-86-2S

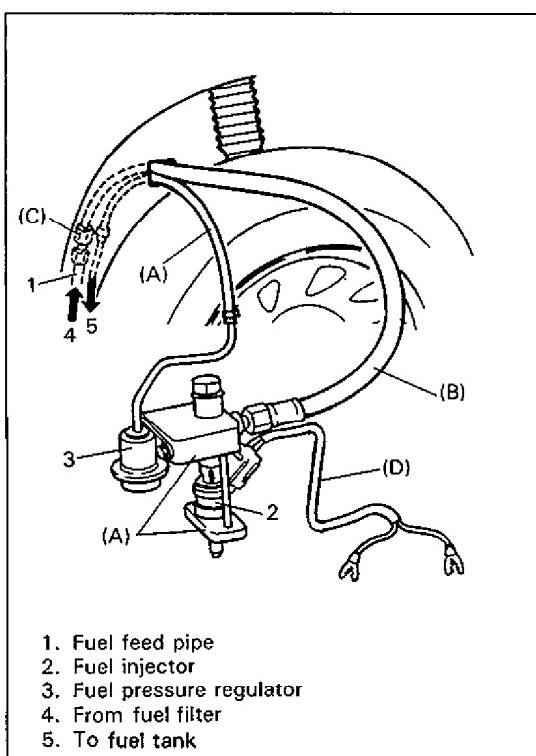
7. Remove fuel delivery pipe bolts.
8. Remove fuel injector(s).

Inspection

WARNING:

**As fuel is injected in this inspection, perform in a well ventilated area and away from open flames.
Use special care to prevent sparking when connection and disconnecting test lead to and from battery.**

60A50-6E1-86-3S



1. Fuel feed pipe
2. Fuel injector
3. Fuel pressure regulator
4. From fuel filter
5. To fuel tank

1. Install injector and fuel pressure regulator to special tool (injector checking tool).

Special Tool

(A): 09912-58421

2. Connect special tools (hoses and attachment) to pipes of vehicle.

Special Tool

(B): 09912-58431

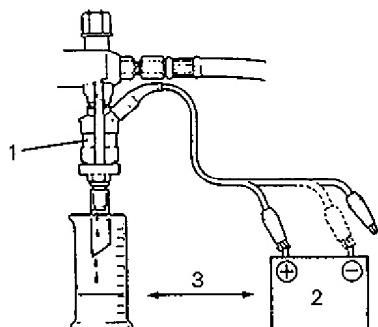
(C): 09919-46010

3. Connect special tool (test lead) to injector.

Special Tool

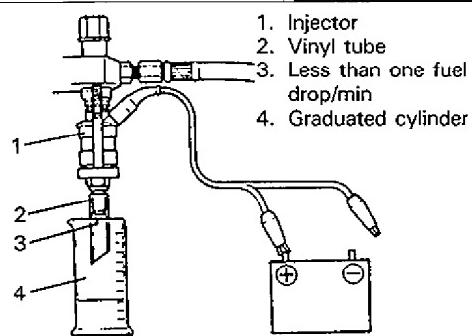
(D): 09930-88530

60A50-6E1-86-4S



1. Injector
2. Battery
3. Keep as far apart as possible

60A50-6E1-87-1S



60A50-6E1-87-3S

4. Install suitable vinyl tube onto injector nozzle to prevent fuel from splashing out when injecting.
5. Put graduated cylinder under injector as shown.
6. Disconnect coupler from fuel pump relay.
7. To operate fuel pump and apply fuel pressure to injector, using wire harness as thick as the one used for fuel pump circuit, connect Black/White and Pink/Black wire harness terminals of fuel pump relay coupler.
8. Apply battery voltage to injector for 15 seconds and measure injected fuel volume with graduated cylinder.
Test each injector two or three times.
If not within specification, replace injector.

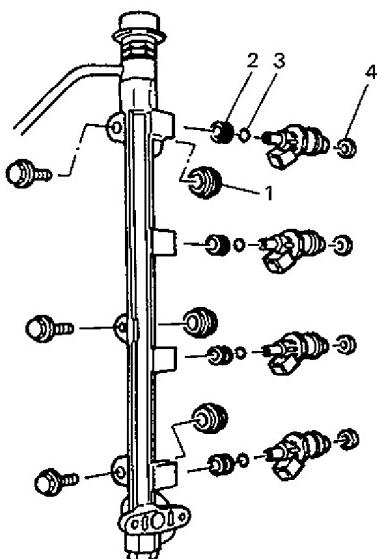
Injected fuel volume:

38—48 cc/15 sec. (1.28/1.34—1.62/1.69 US/Imp. oz/15 sec.)

9. Check fuel leakage from injector nozzle. Do not operate injector for this check (but fuel pump should be at work). If fuel leaks more than following specifications, replace.

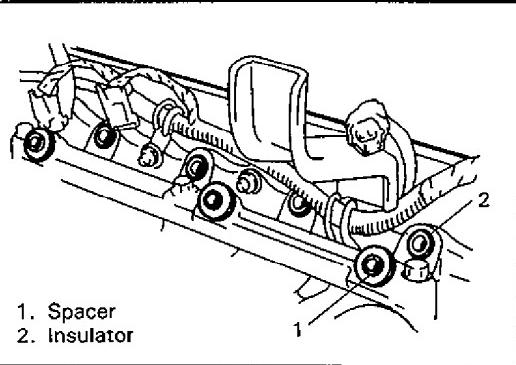
Fuel leakage: Less than 1 drop/min.**Installation**

1. Replace injector O ring with new one using care not to damage it. Install grommet to injector.

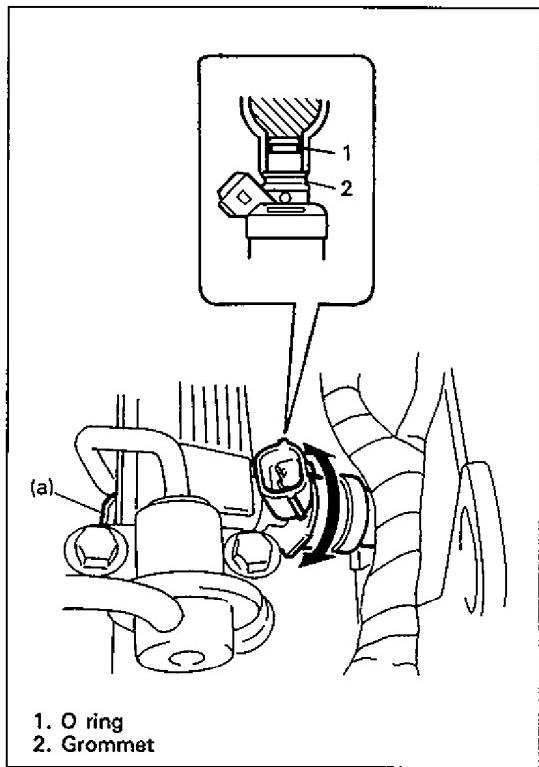


1. Spacer
2. Grommet
3. O ring
4. Insulator

60A50-6E1-87-4S



60A50-6E1-88-1S



60A50-6E1-88-2S

2. Check if insulator is scored or damaged. If it is, replace with new one.
Install insulators and spacers to intake manifold.

3. Apply thin coat of fuel to O rings and then install injectors into delivery pipe and intake manifold.

Make sure that injectors rotate smoothly. If not, probable cause is incorrect installation of O ring. Replace O ring with new one.

4. Tighten delivery pipe bolts and make sure that injectors rotate smoothly.

Tightening Torque

(a): 18–28 N·m (1.8–2.8 kg·m, 13.0–20.0 lb·ft)

5. Install fuel pressure regulator as previously outlined.
6. Install fuel feed pipe clamp bolt.
7. Connect couplers to injectors securely.
8. Install air intake pipe and hose.
9. Connect battery negative cable.
10. With engine "OFF" and ignition switch "ON", check for fuel leaks around fuel line connection.

60A50-6E1-88-4S

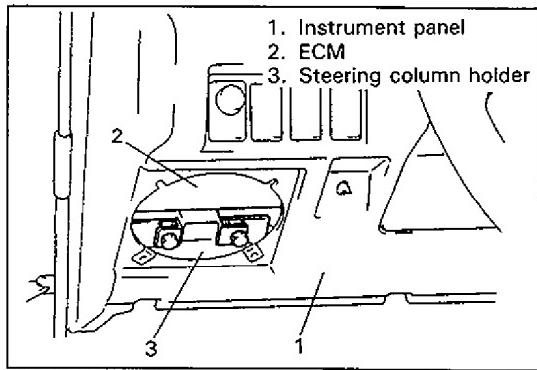
ELECTRONIC CONTROL SYSTEM

ELECTRONIC CONTROL MODULE (ECM)

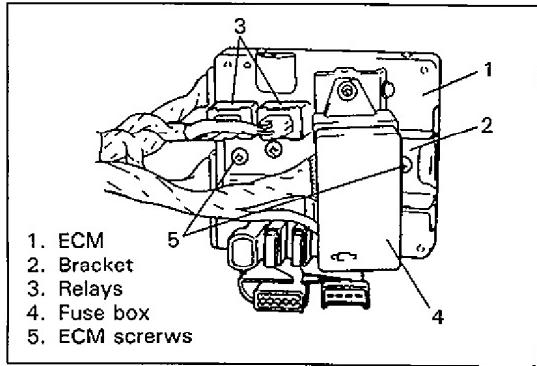
CAUTION:

As ECM consists of precision parts, be careful not to expose it to excessive shock.

60A50-6E1-89-1S



60A50-6E1-89-2S



60A50-6E1-89-3S

Removal

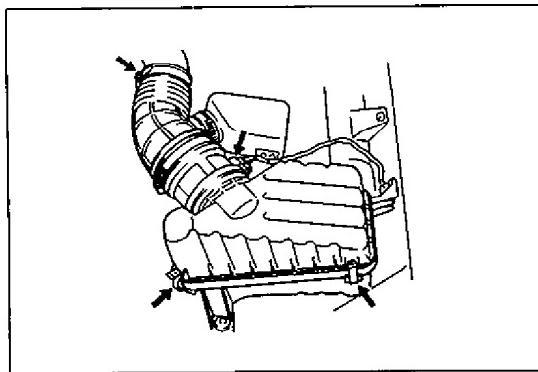
1. Disconnect battery negative cable from battery.
 2. Remove radio speaker cover (driver's seat side).
 3. Remove radio speaker (driver's seat side), if equipped.
 4. Remove ECM with its bracket, fuse box and relays from steering column holder.
-
5. Remove cover and disconnect couplers from ECM, and remove ECM from its bracket.

Installation

Reverse removal procedure noting the following.

- Connect couplers to ECM securely.

60A50-6E1-89-4S



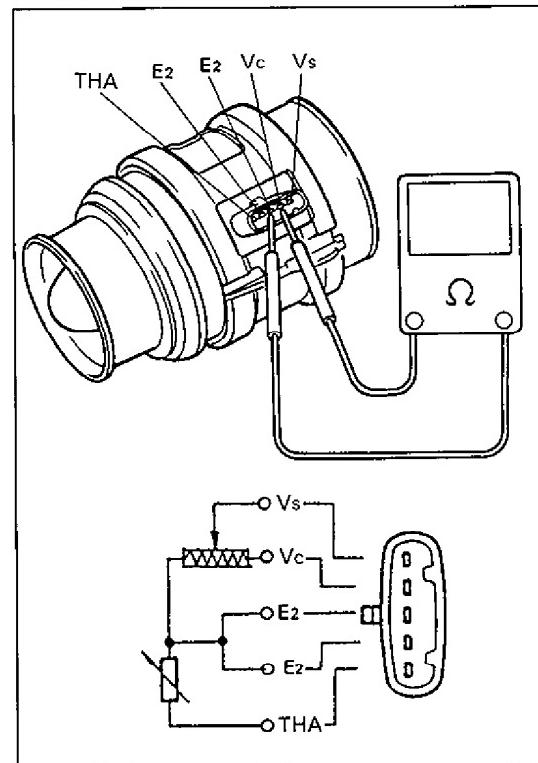
60A50-6E1-90-1S

AIR FLOW METER (AFM)

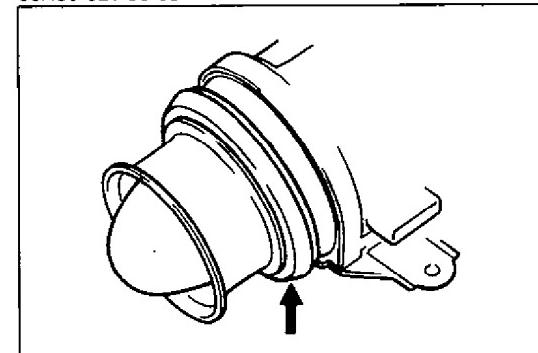
Removal

1. Disconnect negative cable at battery and coupler from AFM.
2. Remove AFM with air cleaner upper case, hose and resonator.
3. Remove AFM from upper case and hose.

60A50-6E1-90-2S



60A50-6E1-90-3S



60A50-6E1-90-5S

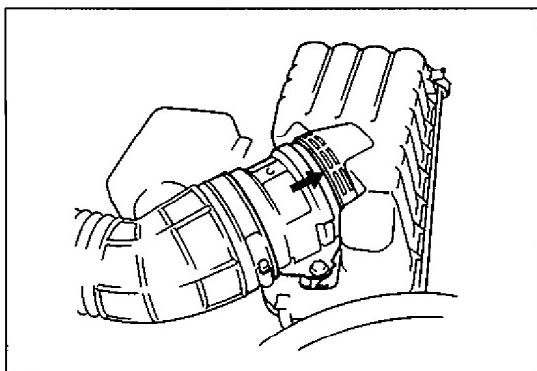
Inspection

1. Check that measuring core moves smoothly.
2. Using ohmmeter, check resistance between each two terminals.

TERMINALS	RESISTANCE	
Between Vs and E ₂	Fully close	200–2000 Ω
	Fully open	20–2000 Ω
Between V _c and E ₂	200–400 Ω	

If found defective, replace.

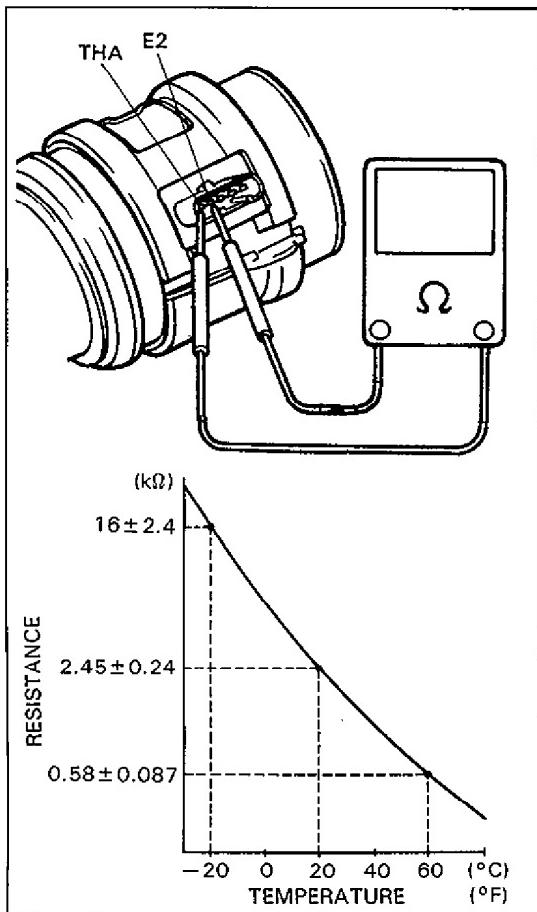
3. Check AFM seal for deterioration and damage.



60A50-6E1-91-1S

Installation

1. Check that AFM seal is fitted in groove of case securely.
2. Install AFM to air cleaner upper case and then confirm that seal is attached securely.
3. Install upper case with AFM, hose and resonator to vehicle and clamp hose securely.
4. Connect AFM coupler securely.



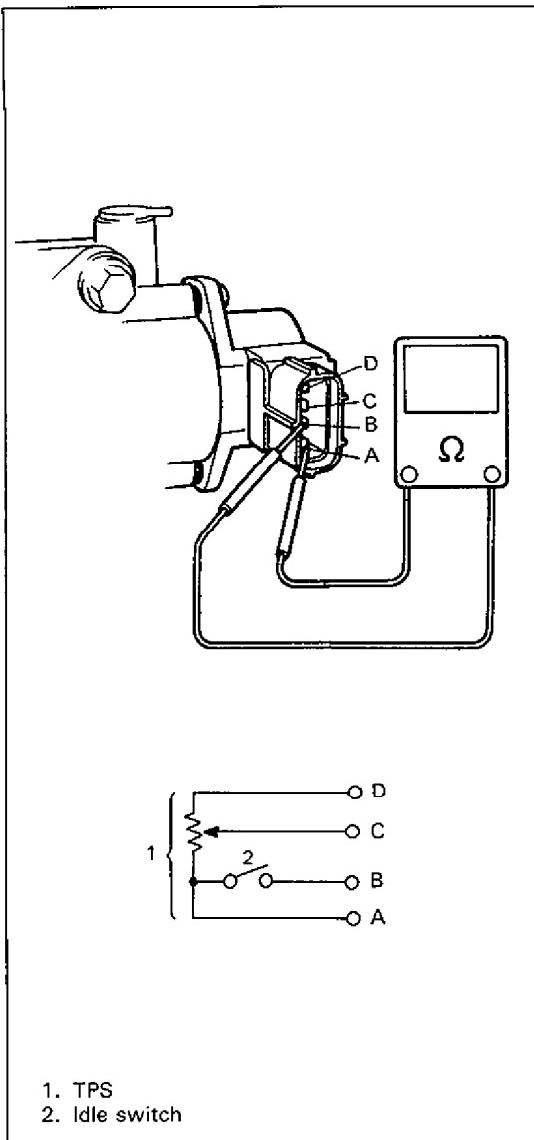
60A50-6E1-91-3S

AIR TEMPERATURE SENSOR (ATS)

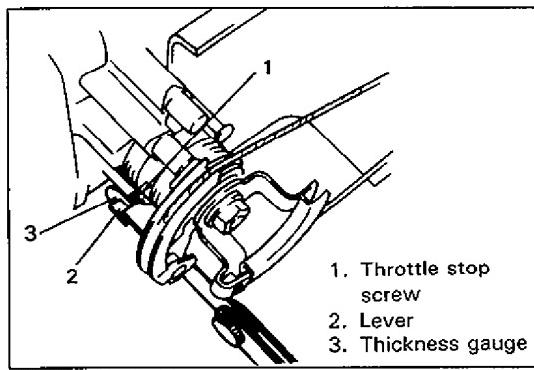
ATS is built in AFM and cannot be removed or installed from and to AFM.

Inspection

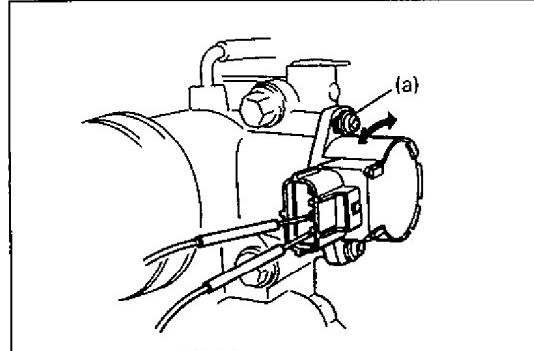
1. Remove AFM as previously outlined.
2. Keep AFM at 20°C (68°F) room temperature for at least 30 minutes and then measure resistance of ATS.
If found defective, replace AFM.
3. Install AFM as previously outlined.



60A50-6E1-92-1S



60A50-6E1-92-4S



60A50-6E1-92-5S

THROTTLE POSITION SENSOR (TPS)

Inspection

1. Disconnect negative cable at battery and coupler from TPS.
2. Using ohmmeter, check resistance between terminals under each condition given in below table.

TERMINALS	CONDITION	RESISTANCE
Between A and B terminals (Idle switch)	When throttle lever-to-stop screw clearance is 0.5 mm (0.020 in.)	0–2.3 kΩ
	When throttle lever-to-stop screw clearance is 0.8 mm (0.031 in.)	∞
Between A and D terminals	—	4.25–8.25 kΩ
Between A and C terminals	Throttle valve is at idle position	0.3–6.3 kΩ
	Throttle valve is fully opened	3.5–10.3 kΩ

If idle switch check result is not satisfactory, adjust installation angle of TPS and if found defective in the other check, replace TPS.

3. Connect TPS coupler securely.
4. Connect negative cable to battery.

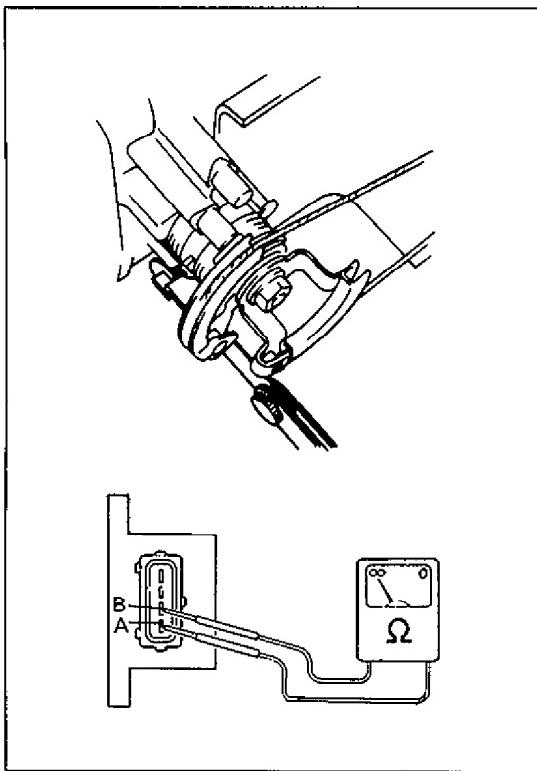
Adjustment

1. Disconnect negative cable at battery and disconnect TPS coupler.
2. Insert 0.65 mm (0.026 in) thickness gauge between throttle stop screw and throttle lever.

3. Loosen TPS screws.
4. Connect ohmmeter between A and B terminals.
5. First, turn TPS counterclockwise fully and then clockwise gradually to find position where ohmmeter reading changes from 0 (zero, continuity) to ∞ (no continuity). Then fix TPS at that position by tightening screw to specified torque.

Tightening Torque

(a): 1.6–2.4 N·m (0.16–0.24 kg·m, 1.2–1.7 lb·ft)



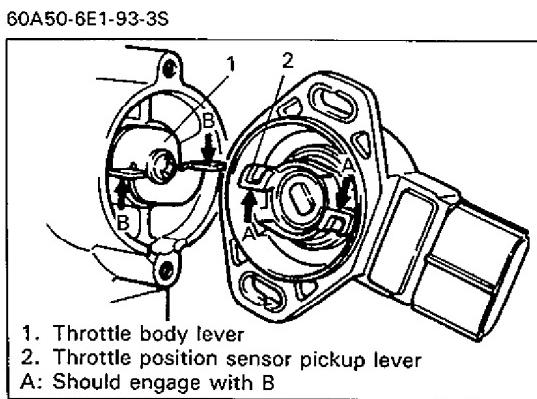
60A50-6E1-93-1S

6. Check that there is no continuity between terminals A and B when 0.8 mm (0.031 in) thickness gauge is inserted.
7. Check that there is continuity between terminals A and B when 0.5 mm (0.020 in) thickness gauge is inserted. If check result is unsatisfactory in steps 6 and 7, it means that installation angle of TPS is not adjusted properly. Therefore, start all over again from step 1.

CAUTION:

As throttle stop screw is factory adjusted precisely, don't remove or adjust it.

8. Connect coupler to TPS securely, and connect battery negative cable.



60A50-6E1-93-3S

Installation

1. To install sensor, place it onto throttle body so that sensor pickup lever can engage with throttle body lever.
2. Hand-tighten TPS screws.
3. Adjust installation angle of TPS according to procedure described in item "Adjustment".
4. Connect coupler to TPS securely
5. Connect battery negative cable to battery.

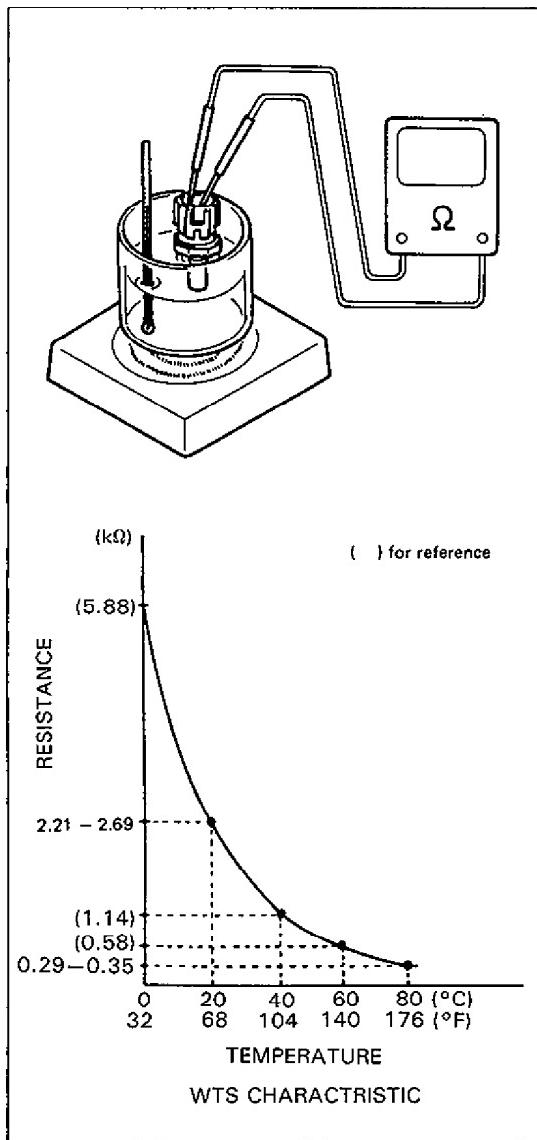
60A50-6E1-93-5S

WATER TEMPERATURE SENSOR (WTS)

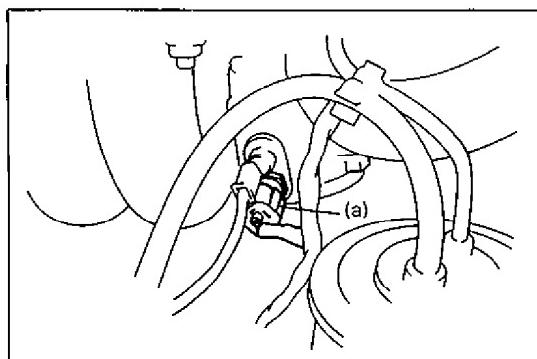
Removal

1. Disconnect negative cable from battery.
2. Drain cooling system.
3. Disconnect coupler from WTS.
4. Remove WTS from intake manifold.

60A50-6E1-94-1S



60A50-6E1-94-2S



Installation

Reverse removal procedure noting the following.

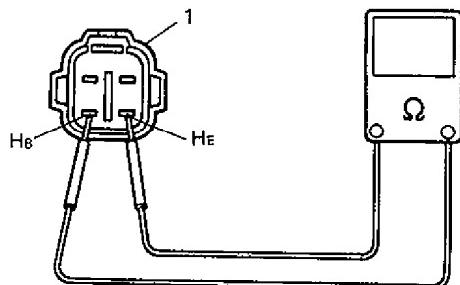
- Clean mating surfaces of sensor and intake manifold.
- Use new gasket.
- Tighten WTS to specified torque.

Tightening Torque

(a): 12.5 – 17.5 N·m (1.25 – 1.75 kg·m, 9.5 – 12.5 lb·ft)

- Connect coupler to sensor securely.
- Refill cooling system.

60A50-6E1-94-5S



1. Viewed from terminal side

60A50-6E1-95-1S

OXYGEN SENSOR (IF EQUIPPED)

Oxygen Sensor Heater Inspection

1. Disconnect sensor coupler.
2. Using ohmmeter, measure resistance between terminals "Hg" and "He" of sensor coupler.

CAUTION:

As connection to wrong terminal will cause damage to oxygen sensor, make absolutely sure to connect properly as shown in figure.

NOTE:

Temperature of sensor affects resistance value largely.
Make sure that sensor heater is at correct temperature.

Resistance of oxygen sensor heater:

11.7 – 15.5 Ω at 20°C, 68°F

If found faulty, replace oxygen sensor.

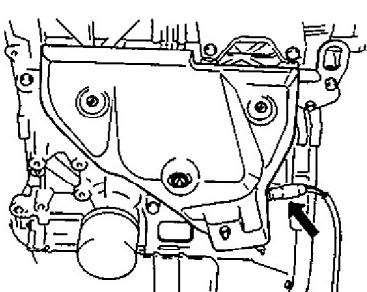
3. Connect sensor coupler securely.

Removal

WARNING:

To avoid danger of being burned, do not touch exhaust system when system is hot. Oxygen sensor removal should be performed when system is cool.

60A50-6E1-95-4S

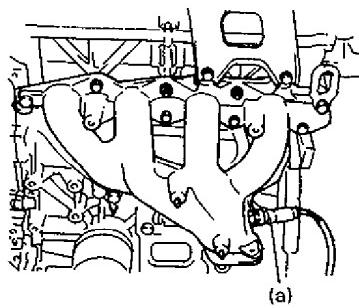


1. Disconnect negative cable from battery.
2. Disconnect coupler of oxygen sensor.
3. Remove exhaust manifold upper cover.
4. Remove oxygen sensor from exhaust manifold.

NOTE:

Be careful not to expose it to excessive shock.

60A50-6E1-95-5S



60A50-6E1-96-1S

Installation

Reverse removal procedure noting the following.

- Tighten oxygen sensor to specified torque.

Tightening Torque

(a): 40—50 N·m (4.0—5.0 kg·m, 29.0—36.0 lb·ft)

- Connect coupler of oxygen sensor and clamp wire harness securely.
- After installing oxygen sensor, start engine and check that no exhaust gas leakage exists.

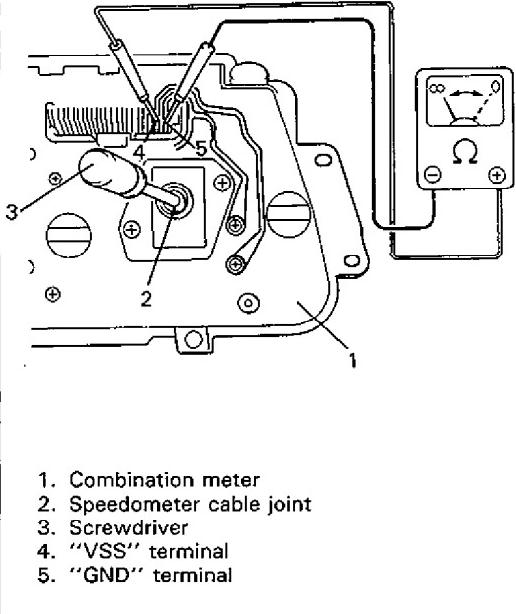
VEHICLE SPEED SENSOR (VSS)

Inspection

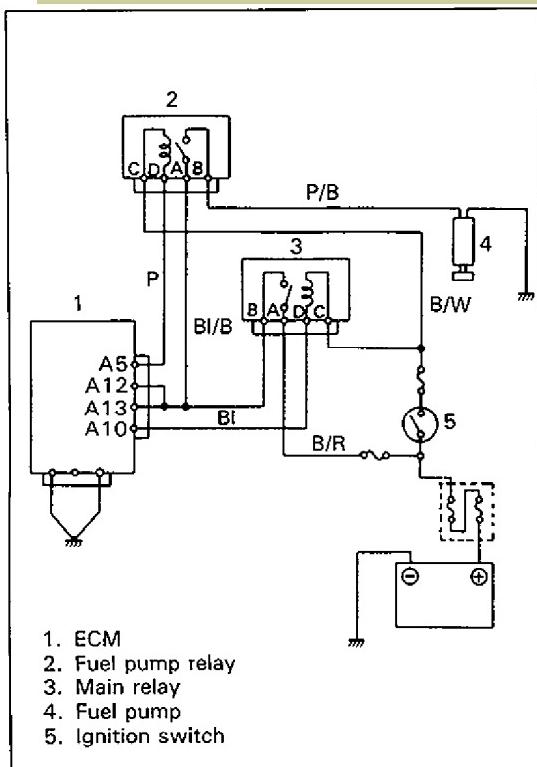
1. Disconnect negative cable at battery.
2. Remove combination meter from instrument panel.
3. Connect ohmmeter between "VSS" terminal and "GND" terminal of combination meter and turn cable joint of speedometer with a screwdriver.
Ohmmeter indicator should move back and forth between 0 (zero) and ∞ (infinity) 4 times while cable joint is turned one full revolution.

Replace speedometer if check result is not satisfactory.

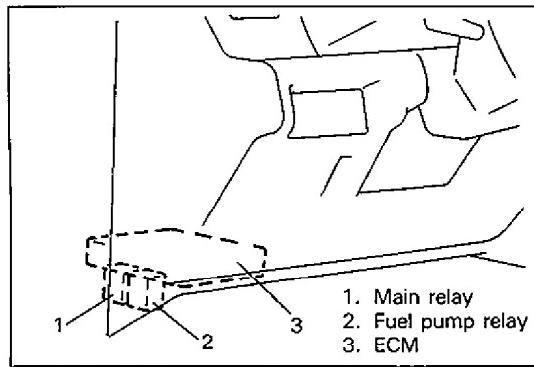
4. Install combination meter to instrument panel.
5. Connect negative cable to battery.



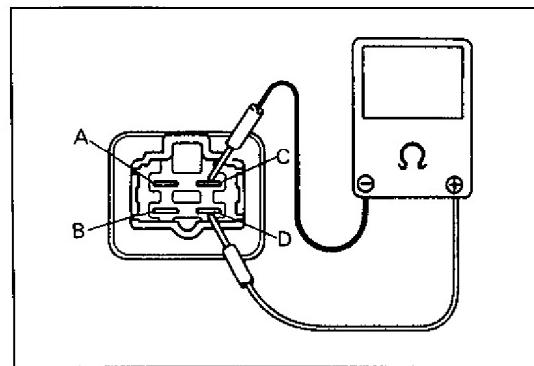
60A50-6E1-96-3S



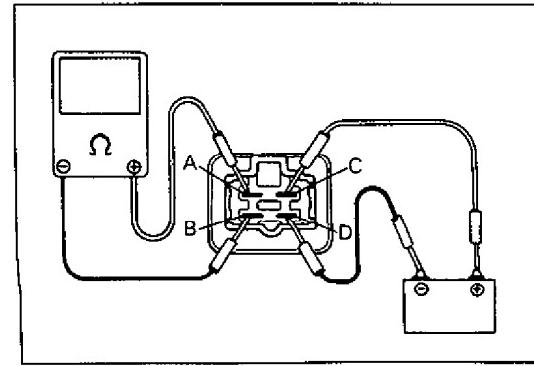
60A50-6E1-97-1S



60A50-6E1-97-3S



60A50-6E1-97-4S



MAIN RELAY

NOTE:

Distinguish between main relay and fuel pump relay by wire colors.

Inspection

1. Disconnect negative cable at battery.

2. Remove main relay from its bracket after disconnecting its coupler.

3. Check resistance between each two terminals as in table below.

If check results are as specified, proceed to next operation check. If not, replace.

TERMINALS	RESISTANCE
Between A and B	∞ (infinity)
Between C and D	56—84 Ω

4. Check that there is continuity between terminals "A" and "B" when battery is connected to terminals "C" and "D".

If found defective, replace.

5. Install relay and connect its coupler securely.

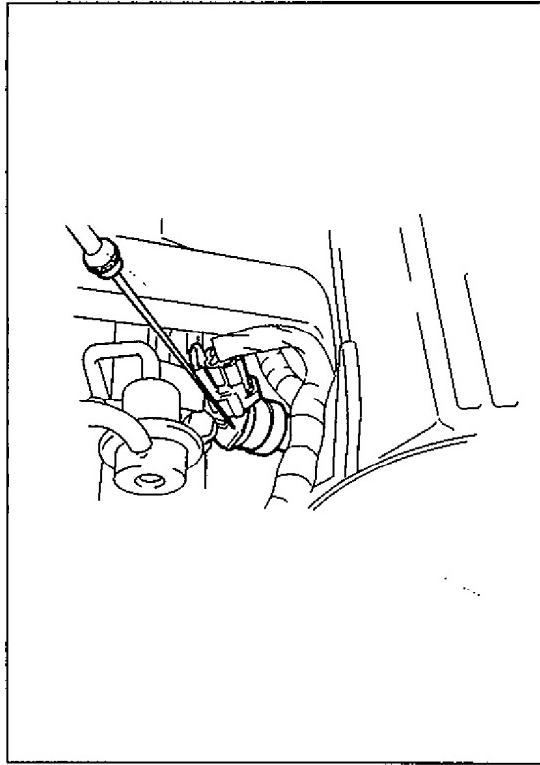
60A50-6E1-97-5S

FUEL PUMP RELAY

Inspection

1. Remove fuel pump relay in the same way as main relay.
2. Structure of fuel pump relay is the same as that of main relay. Check its resistance and operation using the same procedure as that for main relay.
If found defective, replace.

60A50-6E1-98-1S



60A50-6E1-98-3S

FUEL CUT OPERATION

Inspection

NOTE:

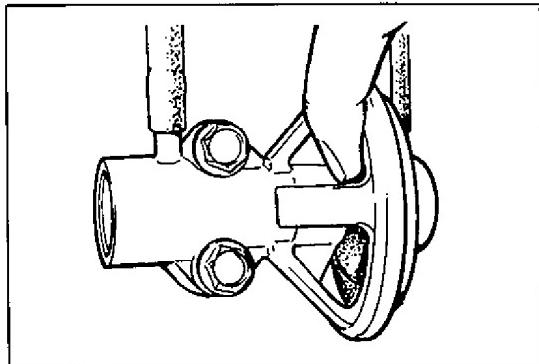
Before inspection, check to make sure that gear shift lever is in neutral position (with A/T model, selector lever in "P" range) and that parking brake lever is pulled all the way up.

1. Warm up engine to normal operating temperature.
2. While listening to sound of injector by using sound scope or such, increase engine speed to higher than 3,000 r/min.
3. Check to make sure that sound to indicate operation of injector stops when throttle valve is closed instantly and it is heard again when engine speed is reduced to less than about 2,000 r/min.

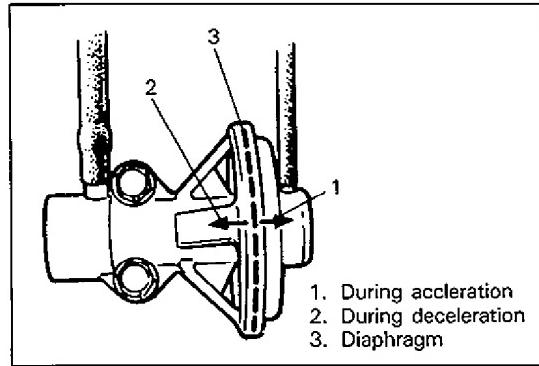
EGR SYSTEM (IF EQUIPPED)**System Inspection****NOTE:**

Make sure that M/T is set in "Neutral" or A/T in "Parking" and that parking brake lever is pulled all the way up.

60A50-6E1-99-1S



60A50-6E1-99-2S



60A50-6E1-99-3S

- When engine is cool (cooling water temperature is below 50°C, 122°F), race engine to higher than 3,500 r/min. and check that EGR valve diaphragm is not operating in this state, by touching diaphragm with finger.

CAUTION:

If EGR valve is hot, it may be necessary to wear gloves to avoid burning fingers.

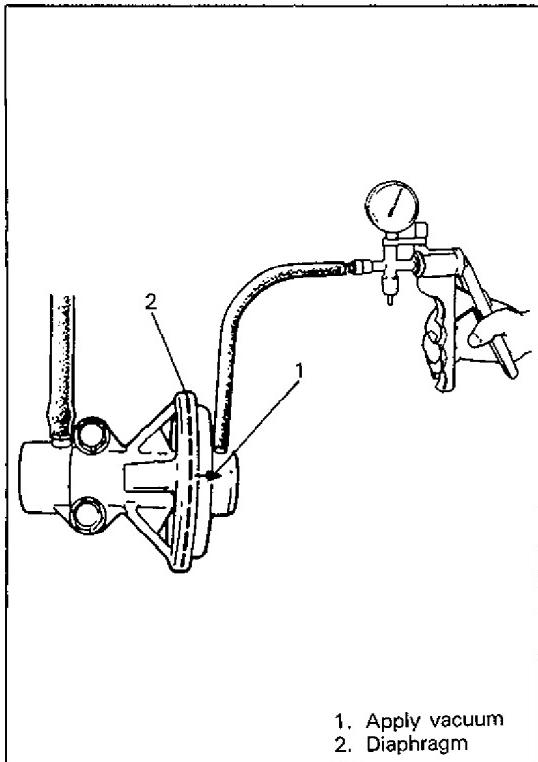
- Warm up engine to normal operating temperature and race it to higher than 3,500 r/min. after warming up. Then check to be sure that diaphragm moves toward 1 in figure at the left during acceleration and toward 2 during deceleration. If EGR valve fails to operate properly, check vacuum hoses, EGR valve, EGR modulator, VSV, wire harness and ECM.
- Keep engine running at idle speed and open EGR valve by hand, and engine should either stop or reduce its speed. If neither occurs, EGR passage is clogged. Clean it.

60A50-6E1-99-4S

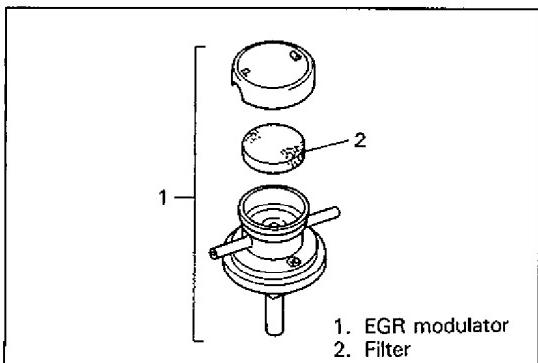
Vacuum Hose Inspection

Check hoses for connection, leakage, clog and deterioration. Replace as necessary.

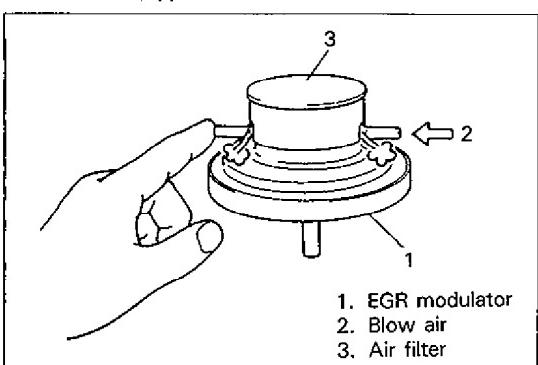
60A50-6E1-99-5S



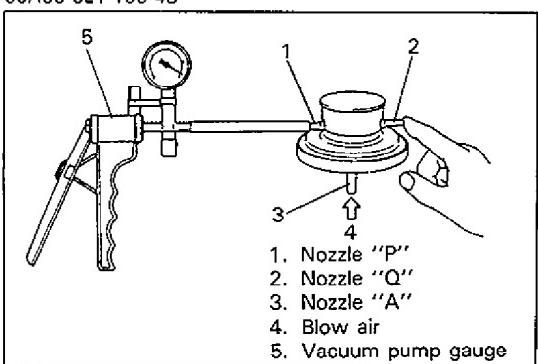
60A50-6E1-100-1S



60A50-6E1-100-3S



60A50-6E1-100-4S



EGR Valve Inspection

1. Disconnect vacuum hose from EGR modulator.
2. Connect vacuum pump gauge to its hose.
3. Check that EGR valve diaphragm moves smoothly and that it is held at the same position when 20 cmHg vacuum is applied to EGR valve.
If diaphragm fails to move smoothly, or it isn't held at the same position, replace EGR valve.
4. After checking, be sure to connect vacuum hose.

EGR Modulator Inspection

1. Check filter for contamination and damage.
Using compressed air, clean filter.

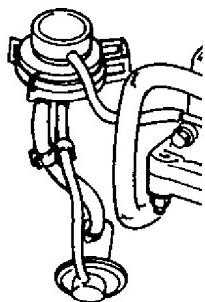
2. Remove EGR modulator and plug nozzle with finger. Blow air into another nozzle and check that air passes through to air filter side freely.

3. Connect vacuum pump gauge to nozzle "P" and plug nozzle "Q" with finger.

While blowing air into nozzle "A", operate vacuum pump gauge and check that vacuum is applied to modulator. Then stop blowing nozzle "A" and check that vacuum pump gauge indicates "0" (zero).

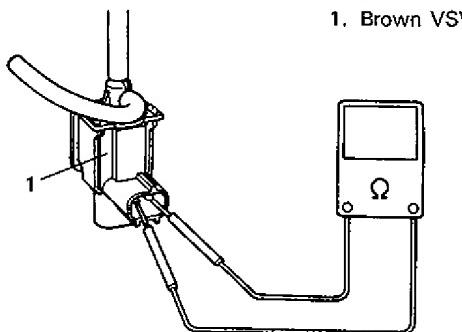
If check result is not satisfactory, replace EGR modulator.

60A50-6E1-100-5S



60A50-6E1-101-1S

4. After checking, install modulator and connect hoses securely.



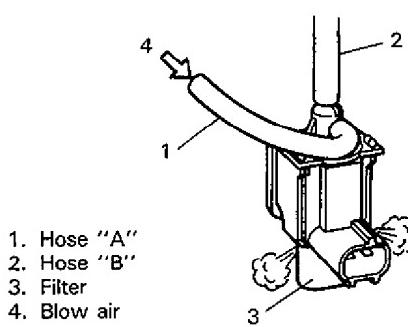
60A50-6E1-101-2S

VSV (Vacuum Switching Valve) Inspection

1. With ignition switch OFF, disconnect coupler from VSV.
2. Check resistance between two terminals of VSV.

Resistance of EGR VSV: 30–38 Ω

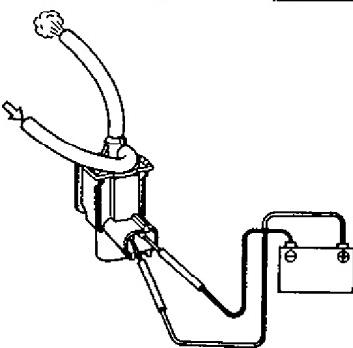
If resistance is as specified, proceed to next operation check. If not repalce.



60A50-6E1-101-3S

3. Disconnect vacuum hoses from pipes.

4. Blow into hose "A". Air should come out of filter and not out of hose "B".



60A50-6E1-101-4S

5. Connect 12V-battery to VSV terminals. In this state, blow hose "A".

Air should come out of hose "B" and not out of filter.

If check result is not as described above, replace VSV.

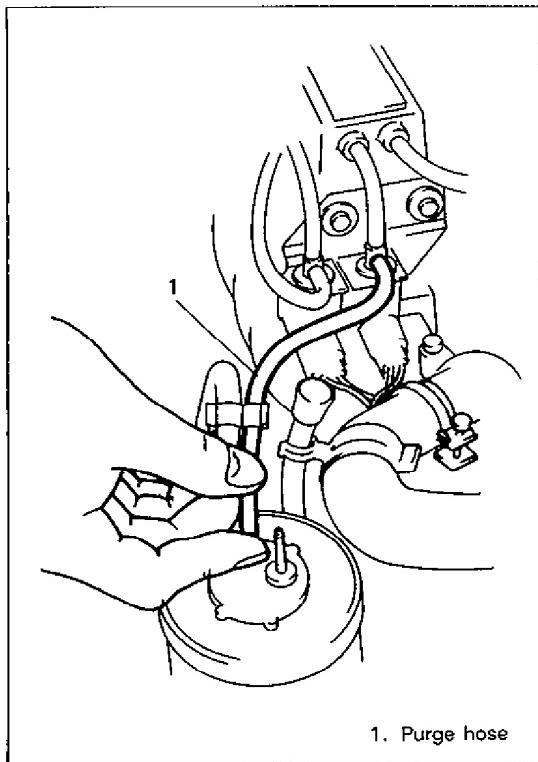
6. Connect VSV coupler securely.
7. Connect vacuum hoses securely.

60A50-6E1-101-5S

FUEL EVAPORATIVE EMISSION CONTROL SYSTEM**Canister Purge Inspection****NOTE:**

Before inspection, check to make sure that gear shift lever is in neutral position (with A/T model, selector lever in "P" range) and that parking brake lever is pulled all the way up.

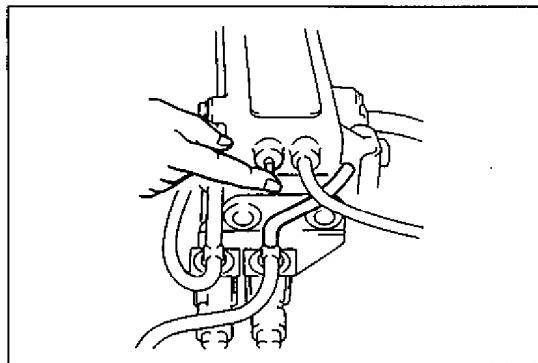
60A50-6E1-102-1S



1. Warm up engine to normal operating temperature.
2. Disconnect purge hose from canister.
3. Place finger against the end of disconnected hose and check that vacuum is not felt there when engine is running at idle speed.
4. Also check that vacuum is felt when engine speed is increased to higher than 3,500 r/min.

If check result is not satisfactory, check vacuum passage, hoses, VSV, wire harness and ECM.

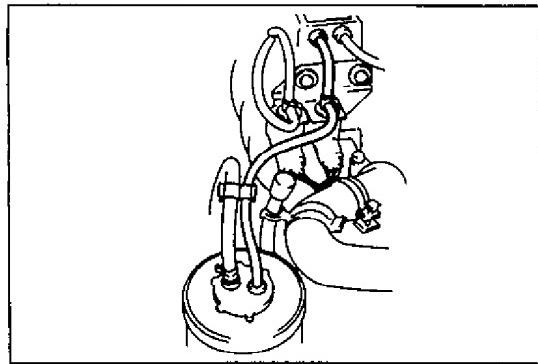
60A50-6E1-102-2S

**Vacuum Passage Inspection**

Start engine and run it at idle speed. With finger placed against vacuum nozzle, check that vacuum is applied.

If it is not applied, clean vacuum passage by blowing compressed air.

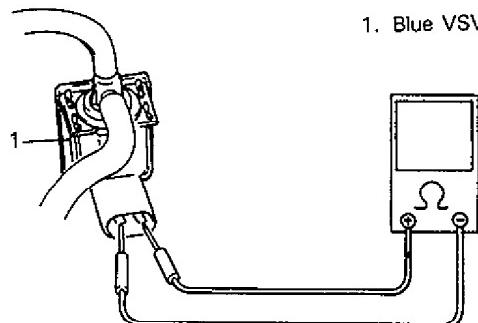
60A50-6E1-102-4S

**Vacuum Hose Inspection**

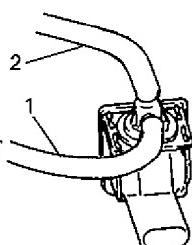
Check hoses for connection, leakage, clog and deterioration. Replace as necessary.

60A50-6E1-102-5S

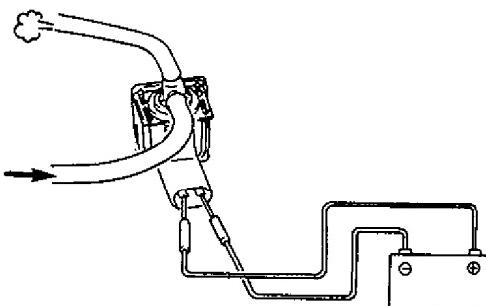
1. Blue VSV



60A50-6E1-103-1S

1. Hose "A"
2. Hose "B"

60A50-6E1-103-2S



60A50-6E1-103-3S

VSV (Vacuum Switching Valve) Inspection

- With ignition switch OFF, disconnect coupler from VSV.
- Check resistance between two terminals of VSV.

Resistance of purge VSV: 30 – 38 Ω

If resistance is as specified, proceed to next operation check. If not, replace.

- Disconnect vacuum hoses from intake manifold and canister.

- With coupler disconnected, blow into hose "A". Air should not come out of hose "B".

- Connect 12V-battery to VSV terminals. In this state, blow hose "A".

Air should come out of hose "B".

WARNING:

Do not suck the air through VSV. Fuel vapor inside VSV is harmful.

If check result is not as described, replace VSV.

- Connect vacuum hoses.

- Connect VSV coupler securely.

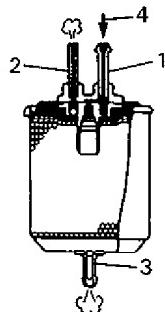
60A50-6E1-103-4S

Charcoal Canister Inspection**WARNING:**

DO NOT SUCK nozzles on canister. Fuel vapor inside canister is harmful.

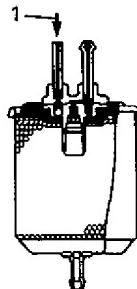
- Disconnect vacuum hoses from canister.

60A50-6E1-103-5S



1. Tank pipe
2. Purge pipe
3. Air pipe
4. Blow air

60A50-6E1-104-1S



1. Blow air

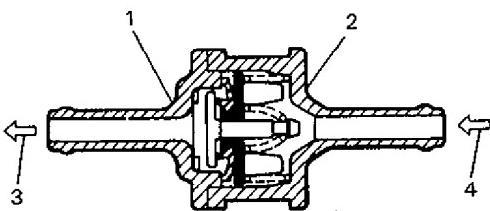
60A50-6E1-104-2S

- When air is blown into tank pipe, there should be no restriction of flow through purge pipe and air pipe.

- When air is blown into purge pipe, air should not pass through either tank pipe or air pipe.

- If operation differs from above description, charcoal canister must be replaced.
- Connect hoses to canister.

60A50-6E1-104-3S



1. Orange side
2. Black side
3. To canister
4. From fuel tank

2-Way Check Valve Inspection

- Remove 2-way check valve installed on fuel tank.
- Air should pass through valve smoothly from fuel tank side (black side of check valve) to orange side when blown hard.
- From orange side, even when blown softly, air should come out of black side.
- If air doesn't pass through valve in step 2 or hard blow is required in step 3, replace 2-way check valve.

WARNING:

DO NOT SUCK air through 2-way check valve. Fuel vapor inside the valve is harmful.

- Install 2-way check valve.

NOTE:

When connecting check valve between hoses, refer to figure at the left for installing direction.

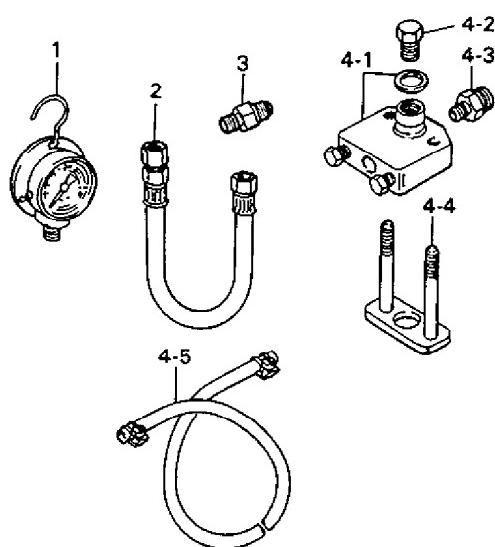
60A50-6E1-104-4S

TORQUE SPECIFICATIONS

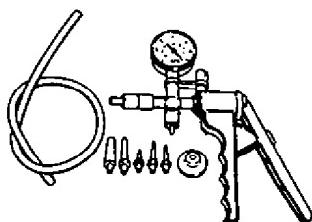
Fastening parts	Tightening torque		
	N·m	kg·m	lb·ft
Throttle body bolts and nuts	18–28	1.8–2.8	13.5–20.0
Fuel delivery pipe bolts	18–28	1.8–2.8	13.5–20.0
TPS screws	1.6–2.4	0.16–0.24	1.2–1.7
WTS	12.5–17.5	1.25–1.75	9.5–12.5
Oxygen sensor	40–50	4.0–5.0	29.0–36.0
ISC valve screws	2.9–4.1	0.29–0.41	2.1–2.9
Fuel pressure regulator	8–12	0.8–1.2	6.0–8.5
Fuel pulsation damper	25–35	2.5–3.5	18.5–25.0
Delivery pipe plug bolt	45–55	4.5–5.5	33.0–39.5
Fuel pipe flare nut	40–50	4.0–5.0	29.0–36.0

60A50-6E1-105-1S

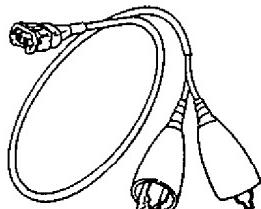
SPECIAL TOOLS



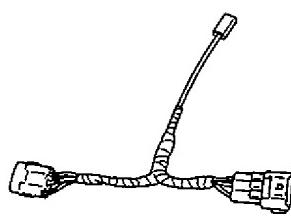
1. Pressure gauge
09912-58441
2. Pressure hose
09912-58431
3. Attachment
09919-46010
4. Checking tool set
09912-58421
 - 4-1. Tool body & washer
 - 4-2. Body plug
 - 4-3. Body attachment
 - 4-4. Holder
 - 4-5. Return hose & clamp



09917-47910
Vacuum pump gauge



09930-88530
Injector test lead



09931-96010
Adapter wire
(For tachometer)

60A50-6E1-105-2S

SECTION 6F1

IGNITION SYSTEM (ESA TYPE)

CONTENTS

GENERAL DESCRIPTION	6F1- 2
DIAGNOSIS	6F1- 3
ON-VEHICLE SERVICE	6F1- 4
Ignition Spark Test	6F1- 4
High-Tension Cords	6F1- 4
Spark Plugs	6F1- 5
Noise Suppressor	6F1- 6
Ignition Coil	6F1- 6
Distributor	6F1- 6
Ignition Timing	6F1- 8
DISTRIBUTOR UNIT	6F1- 9
Removal	6F1- 9
Installation	6F1-10
SPECIAL TOOLS	6F1-11

60A50-6F1-1-1S

GENERAL DESCRIPTION

The ignition system used for this vehicle has an ESA (Electronic Spark Advance) system and consists of the following parts.

- ECM

It detects the engine condition through the signals from the sensors, determines the most suitable ignition timing and time for electricity to flow to the primary coil and sends a signal to the igniter.

- Igniter (Power unit)

It turns ON and OFF the primary current of the ignition coil according to the signal from ECM.

- Ignition coil

When the ignition coil primary current is turned OFF, a high voltage is induced in the secondary winding.

- Distributor

It distributes a high voltage current to each plug.

- High-tension cords and spark plugs

- CAS (Crank Angle Sensor)

Located in the distributor, it converts the crank angle into voltage variation and sends it to ECM. For its details, refer to Section 6E1.

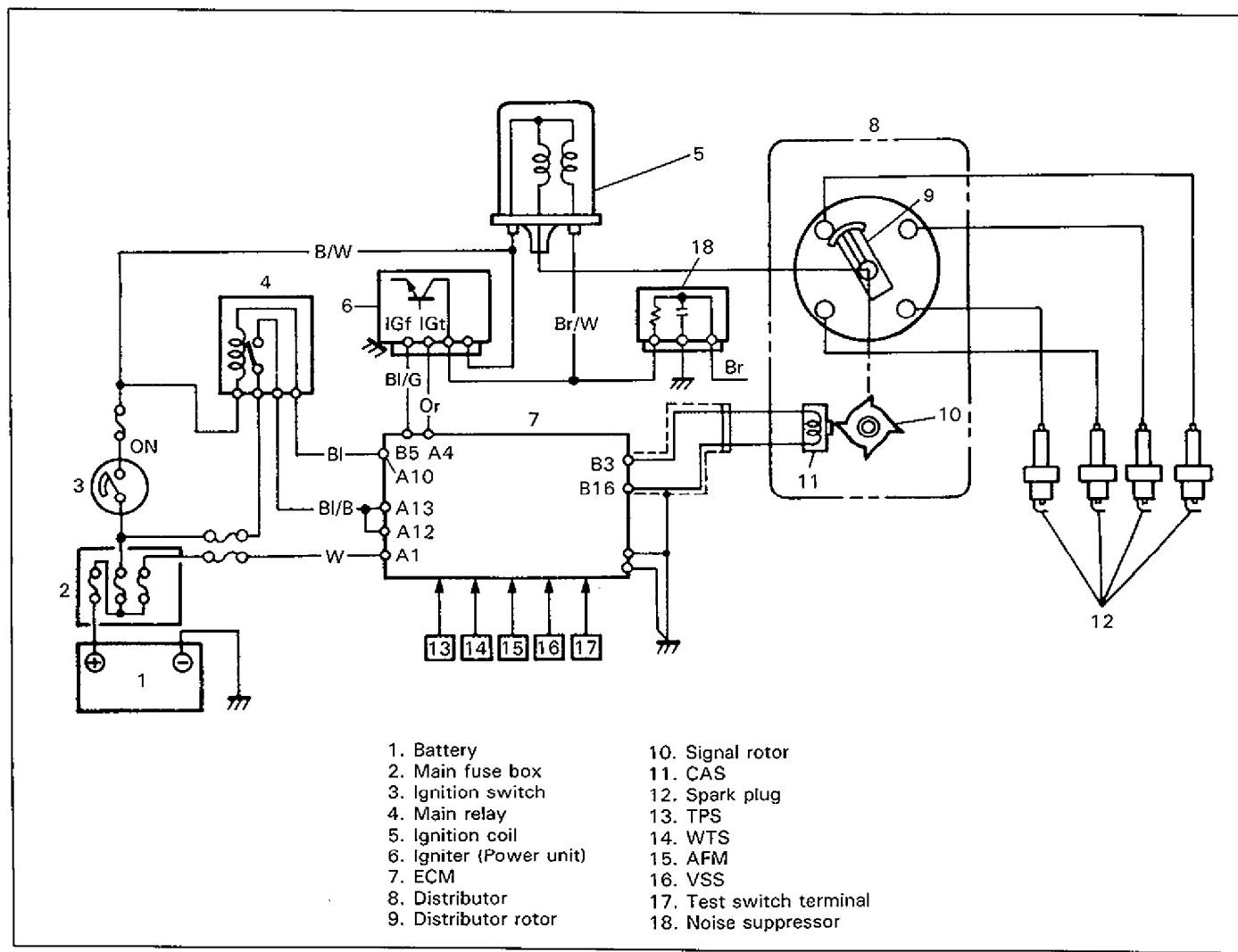
- AFM, TPS, WTS, VSS and test switch terminal

For their details, refer to Section 6E1.

In ESA system, the ECM is programmed for the best ignition timing under every engine condition. Receiving signals which indicate the engine condition from the sensors, e.g., engine revolution, intake air volume, coolant temperature, etc., it selects the most suitable ignition timing from its memory and operates the igniter.

Thus ignition timing is controlled to yield the best engine performance.

For more information, refer to Section 6E1.



DIAGNOSIS

Condition	Possible cause	Correction
Engine cranks, but will not start or hard to start	<p>No spark</p> <ul style="list-style-type: none"> • Faulty spark plug(s) • Blown fuse for ignition coil • Loose connection or disconnection of lead wires or high-tension cord(s) • Worn distributor terminals • Faulty high-tension cord(s) • Cracked rotor or cap • Maladjusted signal rotor air gap • Faulty ignition coil • Faulty noise suppressor • Faulty CAS • Faulty igniter • Faulty ECM <p>Maladjusted ignition timing</p>	Adjust, clean or replace Replace Connect securely Replace Replace Replace Replace Replace Replace Replace Replace Replace Replace Replace Replace Replace Replace Adjust
Poor fuel economy or engine performance	<ul style="list-style-type: none"> • Incorrect ignition timing • Faulty spark plug(s) or high-tension cord(s) • Faulty ECM 	Adjust Adjust, clean or replace Replace

60A50-6F1-3-1S

SELF-DIAGNOSIS

1. To insure correct diagnosis, check to confirm that battery voltage is within standard value when engine is standstill.
2. Turn ON ignition switch and make sure that "CHECK ENGINE" light lights.
3. If engine will not start but cranking is possible, crank it for more than 3 seconds.
4. While ignition switch is ON, ground diagnosis switch terminal in moniter coupler and then read diagnostic code (observe "CHECK ENGINE" light).

DIAGNOSTIC CODE NO. 41



ECM indicates that no ignition fail safe signal is inputted while engine is running or being cranked. Diagnose trouble according to "Diagnostic Flow Chart for Code No.41" in Section 6E1.

60A50-6F1-3-2S

DIAGNOSTIC CODE NO. 42



ECM indicates that no CAS signal is inputted for more than 2 seconds while engine is being cranked.

Diagnose trouble according to "Diagnostic Flow Chart for Code No. 42" in Section 6E1.

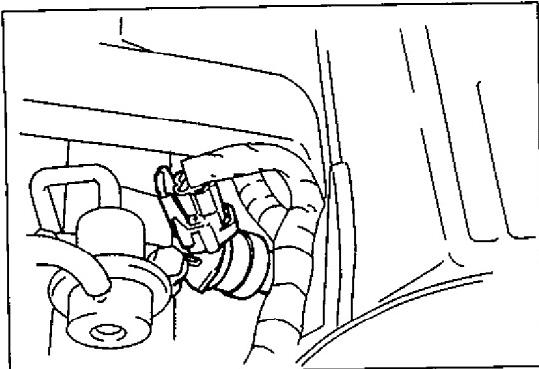
ON-VEHICLE SERVICE

IGNITION SPARK TEST

1. Disconnect all injector couplers.

WARNING:

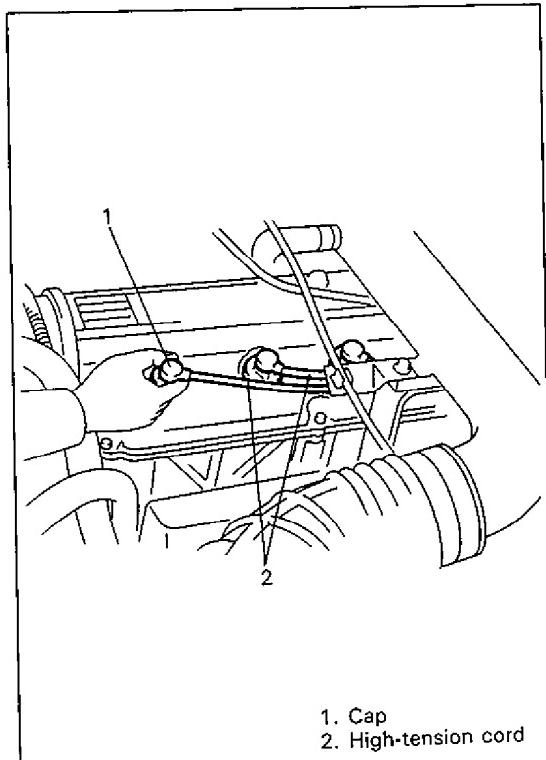
Without disconnection of injector coupler, combustible gas may come out from spark plug holes during this test and may get ignited in engine room.



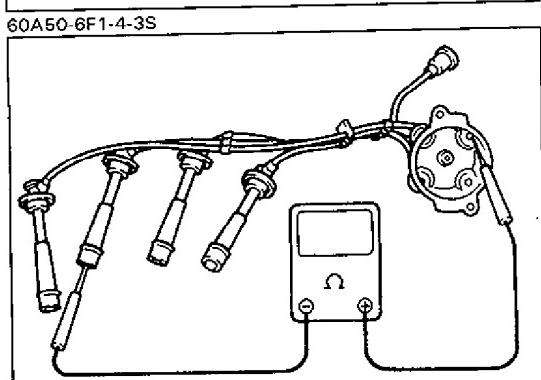
60A50-6F1-4-1S

2. Remove spark plugs and connect them to high-tension cords, and then ground spark plugs.
3. Crank engine and check if each spark plug sparks.
4. If no spark is emitted, inspect high-tension cords, spark plugs, ignition coil, distributor, etc.

60A50-6F1-4-2S



1. Cap
2. High-tension cord



60A50-6F1-4-5S

HIGH-TENSION CORDS

1. Remove high-tension cord at ignition coil while gripping its cap.
2. Remove distributor cap installed with high tension cords.
3. Pull out high-tension cords from spark plugs while gripping each cap.

CAUTION:

- It is recommended to check high-tension cords without unclamping their clamps so as to avoid damage to their inside wire (resistive conductor).
- For the same reason, pull out each connection by gripping cap.

4. Measure resistance of high-tension cord by using ohmmeter.

High-tension cord resistance: $10\text{--}22\text{ k}\Omega/\text{m}$, $3.0\text{--}6.7\text{ k}\Omega/\text{ft}$

5. If resistance exceeds specification, inspect distributor terminal and replace high-tension cord(s) and/or distributor cap as required.

CAUTION:

- Never attempt to use metal conductor high-tension cords as replacing parts.
- Insert each cap portion fully when installing high-tension cords.

60A50-6F1-5-1S

SPARK PLUGS

1. Pull out high-tension cords by gripping their caps and then remove spark plugs.

2. Inspect them for:

- Electrode wear
- Carbon deposits
- Insulator damage

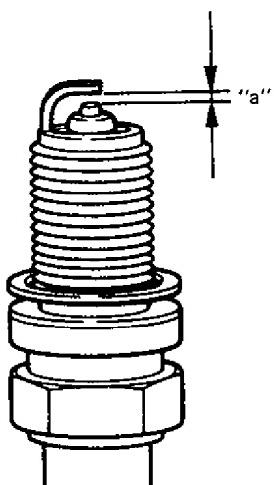
3. If any abnormality is found, adjust air gap, clean with spark plug cleaner or replace them with specified new plugs.

**Spark plug type: NGK BKR6E or BK6E
NIPPONDENSO K20PR-U or K20P-U**

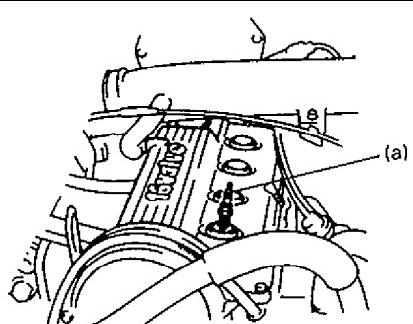
Spark plug gap "a" : 0.7–0.8 mm (0.028–0.031 in)

Two kinds of spark plugs are used in this vehicle, one without R mark and the other with R mark, depending on countries.

Look at the label attached to the vehicle. If originally equipped plugs were with R mark, plugs with R mark should be used for replacement.



60A50-6F1-5-3S



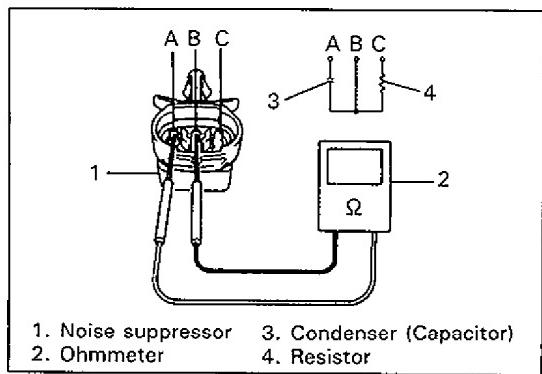
4. Install spark plugs and torque them to specification.

Tightening Torque

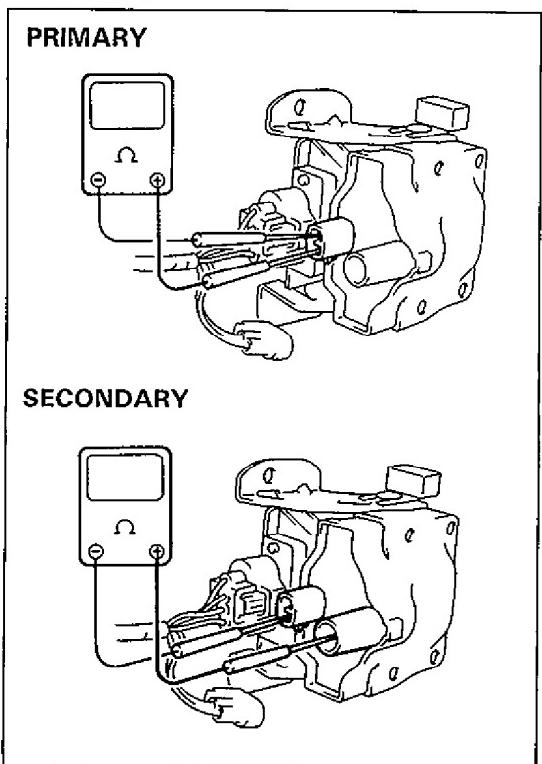
(a): 25–30 N·m (2.5–3.0 kg·m, 18.0–21.5 lb·ft)

5. Install high-tension cords securely by gripping their caps.

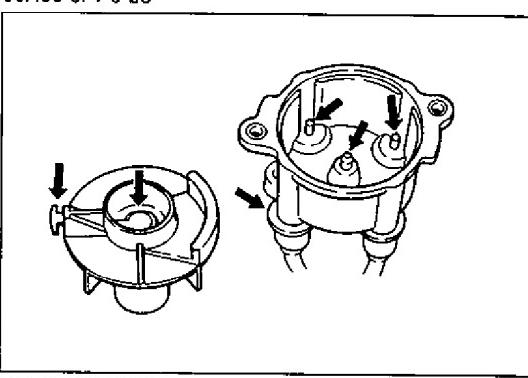
60A50-6F1-5-5S



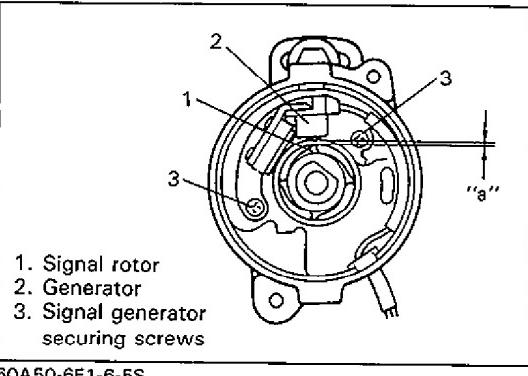
60A50-6F1-6-1S



60A50-6F1-6-2S



60A50-6F1-6-4S



60A50-6F1-6-5S

NOISE-SUPPRESSOR

1. Disconnect coupler of noise suppressor.
2. Using ohmmeter, check to be sure that condenser is not conductive and resistor has resistance of about $2.2\text{ k}\Omega$.
3. If check result is not satisfactory, replace noise suppressor.

IGNITION COIL

1. Pull out high-tension cord by gripping its cap.
2. Disconnect ignition coil coupler.
3. Measure primary and secondary coil resistances.

Ignition coil resistance at 20°C (68°F):

Primary $0.9 - 1.1\ \Omega$

Secondary $10.2 - 13.8\text{ k}\Omega$

DISTRIBUTOR

Distributor Cap and Rotor

Check cap and rotor for crack and their terminals for corrosion and wear. Replace as necessary.

Signal Rotor Air Gap

1. Remove distributor cap, rotor and cover.
2. Using thickness gauge, measure air gap between signal rotor tooth and generator (CAS).

Signal rotor air gap "a" : $0.2 - 0.3\text{ mm}$ ($0.0079 - 0.0118\text{ in}$)

3. If gap is out of specification, loosen signal generator securing screws.

Using blade (—) screw driver, move generator and adjust gap to specification.

After adjustment, tighten securing screws and recheck gap.

NOTE:

Check to make sure that signal generator tooth is free from any metal particles.

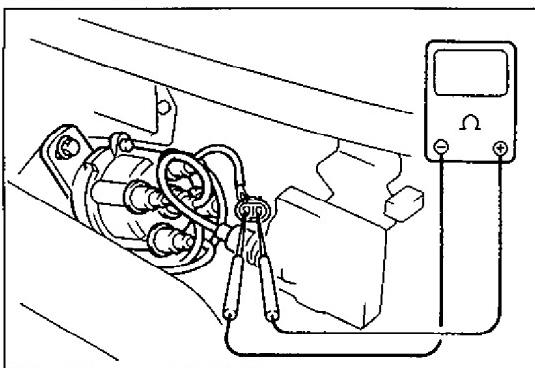
4. Install distributor cover, rotor, cap seal and cap.

Pickup Coil Resistance

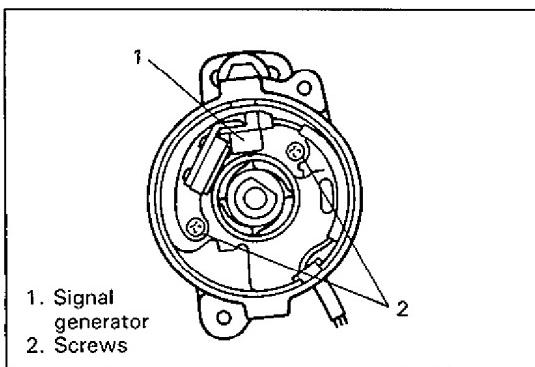
1. Disconnect distributor lead coupler.
2. Measure resistance of pickup coil by using ohmmeter.
3. If resistance is out specification, replace signal generator as follows.

Pickup coil resistance at 20°C (68°F): 140—180 Ω

60A50-6F1-7-1S



60A50-6F1-7-2S



60A50-6F1-7-3S

4. Remove distributor cap, rotor and cover.
5. Remove signal generator securing screws.
6. Replace signal generator.
7. Adjust signal rotor air gap to specification as previously outlined.
8. Install cover, rotor, distributor cap seal and cap.

IGNITION TIMING

INSPECTION AND ADJUSTMENT

1. Start engine and warm it up to normal operating temperature.
2. Make sure that:
 - All of electrical loads except ignition are switched off.
 - A/C is OFF, if equipped.
 - M/T is set in neutral (A/T is set in "P" range).
 - Parking brake lever is pulled fully.
3. Check to be sure that idle speed is within specification.
4. Set timing light to No.1 high tension cord.
5. Remove cap from monitor coupler beside battery. Connect "C" and "D" terminals of monitor coupler by using service wire so that ignition timing is fixed.

NOTE:

In this state, observe ignition timing with timing light. If it is varying (if it is not fixed), that indicates ungrounded "D" terminal which prevents accurate inspection and adjustment. Therefore, be sure to ground it securely.

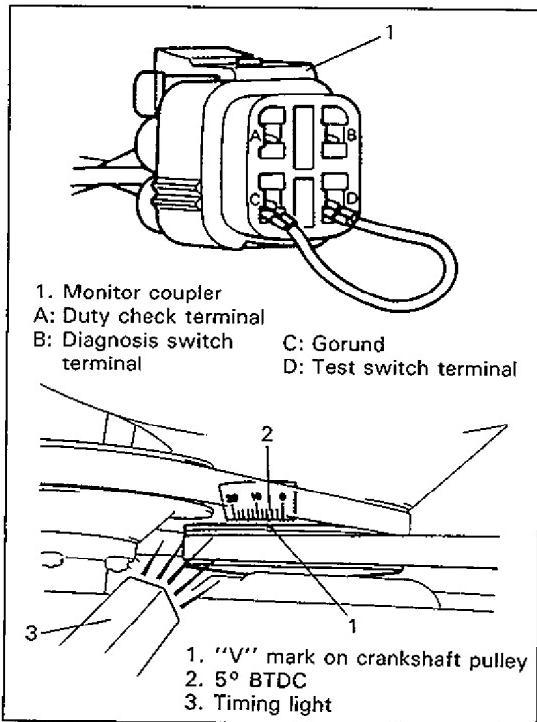
6. Using timing light, check that timing is within specification.

Initial ignition timing (Test switch terminal grounded):

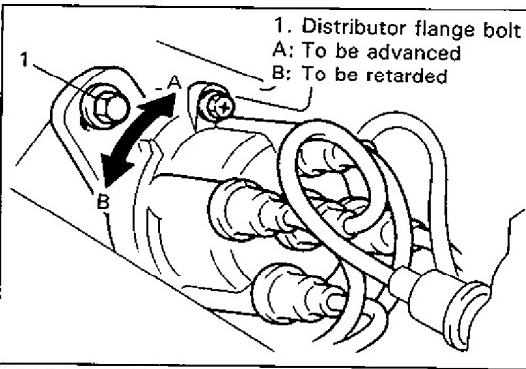
$5 \pm 1^\circ$ BTDC at 800 r/min.

Ignition order: 1-3-4-2

60A50-6F1-8-1S



60A50-6F1-8-2S



60A50-6F1-8-4S

7. If ignition timing is out of specification, loosen flange bolts, adjust timing by turning distributor assembly while engine is running, and then tighten bolts.
8. After tightening distributor flange bolts, recheck that ignition timing is within specification.

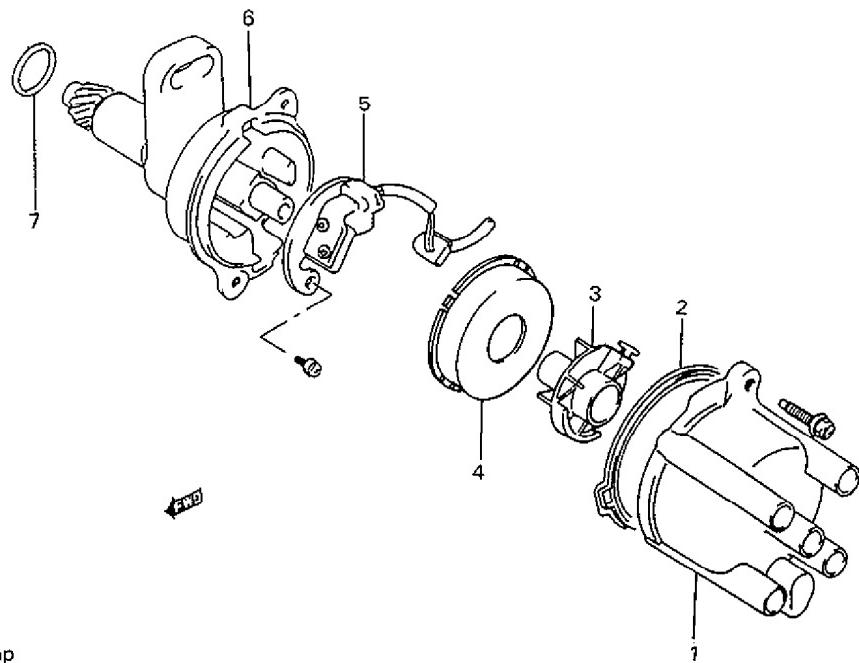
9. After checking and/or adjusting, disconnect service wire from monitor coupler.

NOTE:

In this state, ignition timing may vary more or less of 8° BTDC but it is nothing abnormal.

10. Verify that increasing engine speed advances ignition timing.

DISTRIBUTOR UNIT

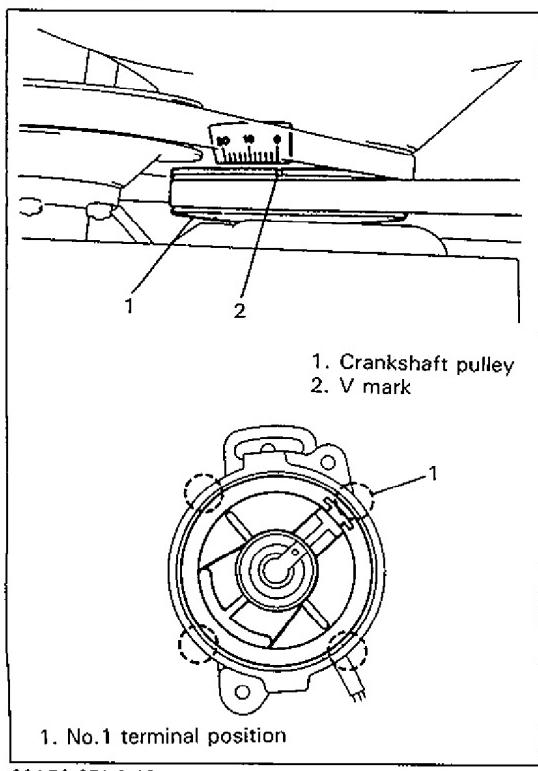


- 1. Distributor cap
- 2. Packing (seal)
- 3. Rotor
- 4. Cover
- 5. Signal generator
- 6. Housing
- 7. O ring

60A50-6F1-9-1S

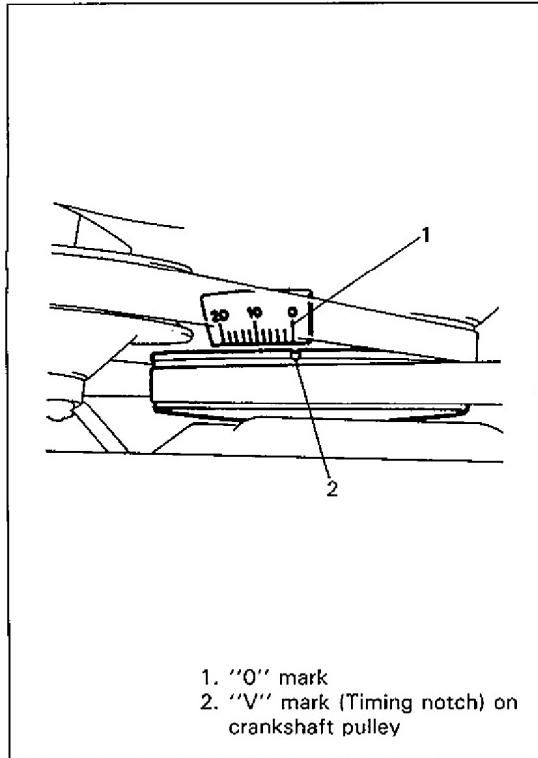
REMOVAL

1. Disconnect negative cable at battery.
2. Disconnect distributor (CAS) coupler.
3. Remove distributor cap. Then to facilitate re-installation, turn crankshaft in normal direction (clockwise as viewed from crankshaft pulley side) so that distributor rotor is positioned at No.1 terminal of distributor cap.
4. Remove distributor flange bolt.
5. Pull out distributor housing assembly.

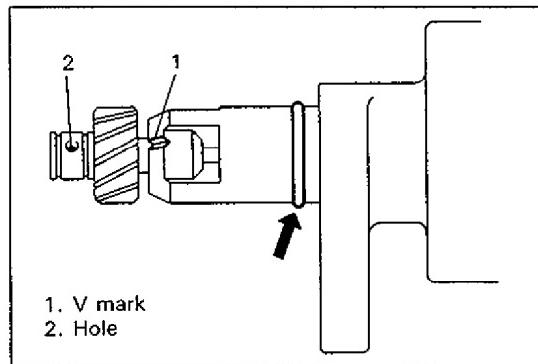


60A50-6F1-9-4S

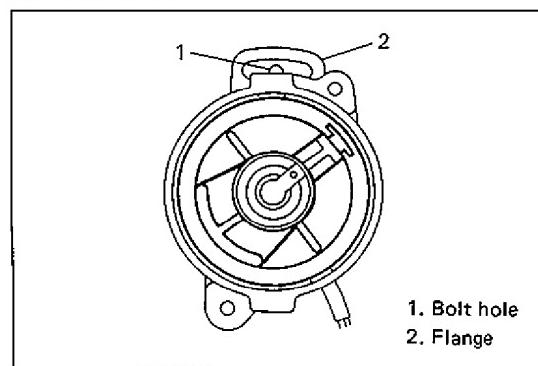
INSTALLATION



60A50-6F1-10-1S



60A50-6F1-10-3S



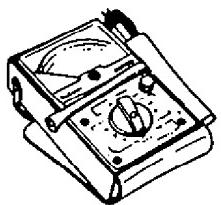
60A50-6F1-10-4S

2. Check O ring for damage and deterioration.
Replace if necessary.
Apply engine oil to it.
3. Align hole on gear with "V" mark on housing.

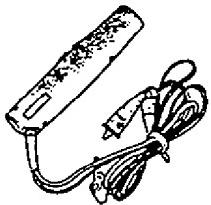
4. Insert distributor into gear case in such a way that the center of distributor flange will coincide with distributor flange bolt hole provided in distributor gear case. When inserting the distributor completely, position of distributor rotor becomes as shown in figure. Secure distributor in place tentatively by making flange bolt finger-tight.

5. Check to make sure that rotor is in good condition.
6. Inspect distributor cap and clean or replace as required.
7. Make sure that distributor cap seal is placed properly and install cap, and then fasten it with screws.
8. Connect distributor coupler.
9. Connect negative cable at battery.
10. Check and adjust ignition timing as previously outlined.

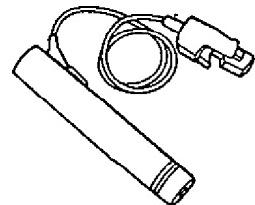
SPECIAL TOOLS



09900-25002
Pocket tester



09900-27301
Timing light (DC 12V)



09930-76420
Timing light
(Dry cell type)

60A50-6F1-11-1S

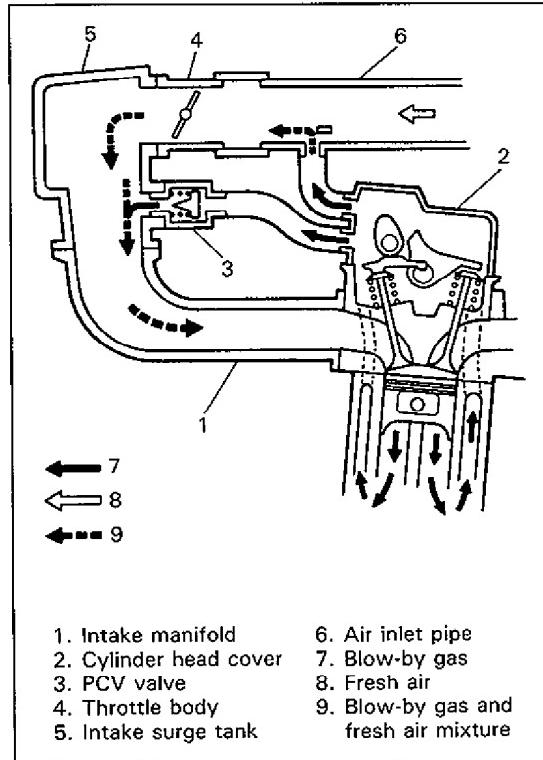
SECTION 6J

EMISSION CONTROLS

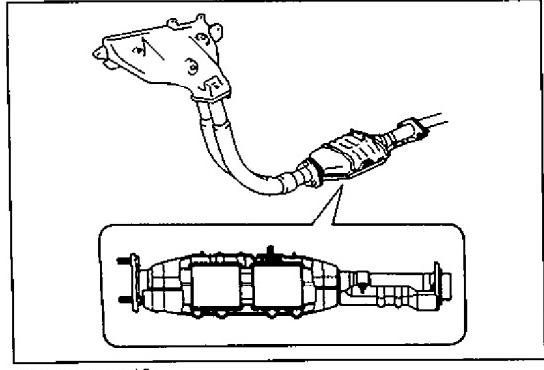
CONTENTS

GENERAL DESCRIPTION	6J-1
Positive Crankcase Ventilation (PCV) System	6J-1
Three-Way Catalyst (If equipped)	6J-1
ON VEHICLE SERVICE	6J-2
PCV System	6J-2

60A50-6J-1-1S



60A50-6J-1-3S



60A50-6J-1-5S

GENERAL DESCRIPTION

POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

The term "blow-by gas" stands for the compressed gas and exploded gas which blow through cylinder-to-piston clearance, which contain a large amount of unburned gases such as CO and HC.

The PCV (Positive Crankcase Ventilation) system is provided to prevent the blow-by gas from being emitted into atmosphere and it operates as follows.

When the vacuum in the intake manifold is low (throttle valve open), the PCV valve is wide open due to its spring force. Thus a large amount of the blow-by gas is drawn into the intake manifold.

On the other hand, when the vacuum in the manifold is high, the PCV valve opening is limited due to the high vacuum. Thus the amount of the blow-by gas drawn into the intake manifold is small.

THREE-WAY CATALYST (If equipped)

The three-way catalyst is provided in the exhaust system (exhaust center pipe). The function of the catalyst is to reduce the emission of CO, HC and NOx in the exhaust gas by oxidizing or converting them into CO₂, H₂O and N₂ respectively.

ON VEHICLE SERVICE

PCV SYSTEM

NOTE:

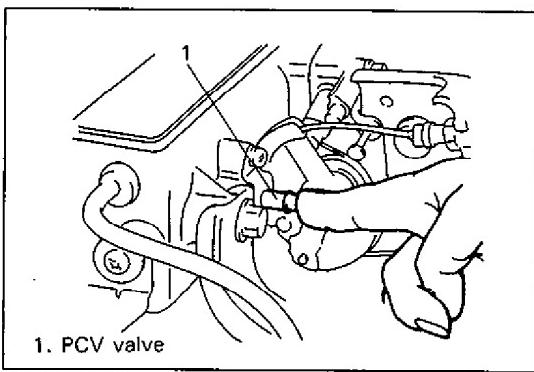
Be sure to check that there is no obstruction in PCV valve or its hoses before adjusting engine idle speed, for obstructed PCV valve or hose hampers its accurate adjustment.

60A50-6J-2-1S

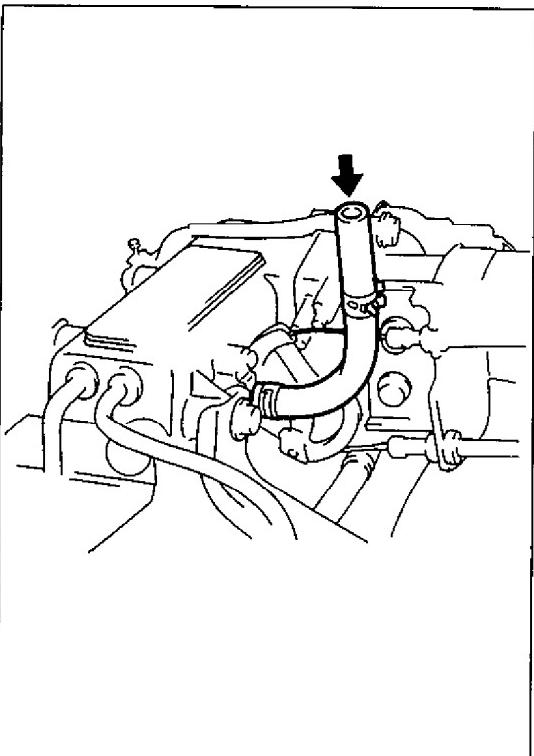
PCV HOSE

Check hoses for connection, leakage, clog, and deterioration. Replace as necessary.

60A50-6J-2-2S



60A50-6J-2-3S



PCV VALVE

1. Remove stiffener.
2. Disconnect PCV hose from PCV valve.
3. Run engine at idle.
4. Place your finger over end of PCV valve to check for vacuum. If there is no vacuum, check for clogged valve. Replace as necessary.

5. After checking vacuum, stop engine and check PCV valve for sticking.

With engine stopped, connect a new hose to PCV valve. Blow air into new hose and check that air flow with difficulty from cylinder head side to intake manifold side. If air flows without difficulty, valve is stuck in "Open" position. Replace PCV valve.

6. Connect PCV hose and clamp securely.

WARNING:

Do not suck air through PCV valve. Petroleum substances inside the valve and fuel vapor inside the intake manifold are harmful.

60A50-6J-2-4S

SECTION 6K

EXHAUST SYSTEM

CONTENTS

GENERAL DESCRIPTION	6K-1
MAINTENANCE	6K-2
ON VEHICLE SERVICE	6K-2

NOTE:

There are two types of this model depending on specifications: one with a catalytic converter and the other without it.

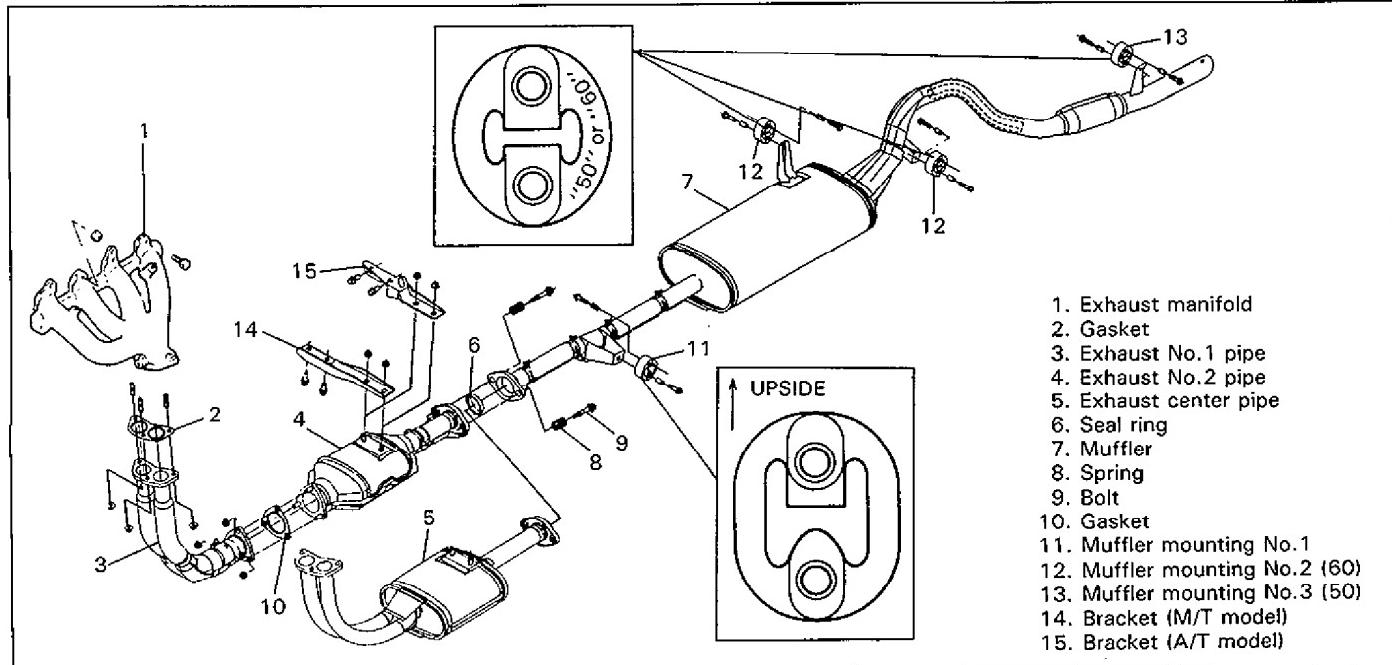
60A50-6K-1-1S

GENERAL DESCRIPTION

The exhaust system of the catalytic converter equipped vehicle consists of the exhaust manifold, exhaust No. 1 pipe, exhaust No. 2 pipe, muffler, seals, gasket, etc. while the vehicle without catalytic converter has an exhaust center pipe instead of the above exhaust No. 1 and No. 2 pipes. The catalytic converter is an emission control device added to the exhaust system to lower the level of Hydrocarbon (HC), Carbon Monoxide (CO) and Oxides of Nitrogen (NOx) pollutants in the exhaust gas. The catalyst in the catalytic converter is of "Three way" type.

CAUTION:

Be sure to use UNLEADED FUEL for the catalytic converter equipped vehicle. Use of LEADED FUEL will affect performance of the catalytic converter adversely to a great extent.



60A50-6K-1-2S

MAINTENANCE

WARNING:

To avoid danger of being burned, do not touch exhaust system when system is hot. Any service on exhaust system should be performed when system is cool.

At every interval of periodic maintenance service, and when vehicle is raised for other service, check exhaust system as follows:

- Check rubber mountings for damage, deterioration and out of position.
- Check exhaust system for leakage, loose connection, dent and damage. If bolts or nuts are loosened, tighten them to specified torque. Refer to "ON VEHICLE SERVICE" for torque data.
- Check nearby body areas for damaged, missing, or mispositioned part, open seam, hole, loose connection or any other defect which could permit exhaust fumes to seep into vehicle.
- Make sure that exhaust system components have enough clearance from underbody to avoid overheating and possible damage to passenger compartment carpet.
- Any defect should be fixed at once.

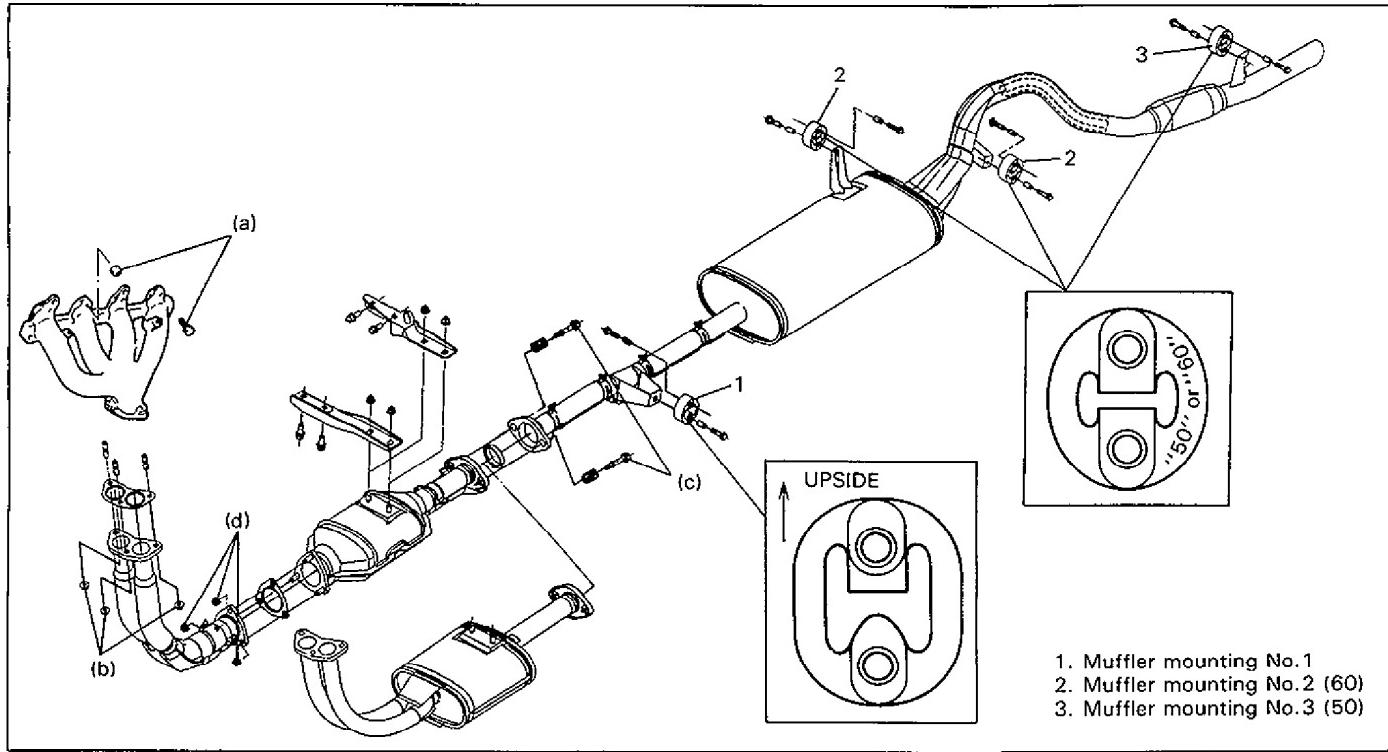
ON VEHICLE SERVICE

- Refer to Section 6A1 for removal and installation procedures of exhaust manifold.
- For replacement of exhaust No.1 pipe, exhaust No.2 pipe (or exhaust center pipe), muffler or any part used to mount or connect them, be sure to hoist vehicle and observe WARNING given at the left of this page.

CAUTION:

As exhaust No.2 pipe has catalytic converter in it, it should not be exposed to any impulse. Be careful not to drop it or hit it against something.

- When exhaust manifold is removed, check gaskets and seal for deterioration or damage. Replace them as necessary.
 - Tighten bolts and nuts to specified torques when reassembling. Refer to figure below for location of bolts and nuts.
- Tightening Torque**
- (a): 18–28 N·m (1.8–2.8 kg·m, 13.0–20.0 lb·ft)
 - (b): 50–70 N·m (5.0–7.0 kg·m, 36.5–50.5 lb·ft)
 - (c): 40–60 N·m (4.0–6.0 kg·m, 29.0–43.0 lb·ft)
 - (d): 37–43 N·m (3.7–4.3 kg·m, 27.0–31.0 lb·ft)
- There are two types of muffler mounting. Refer to figure below for their correct use.



SECTION 7B1

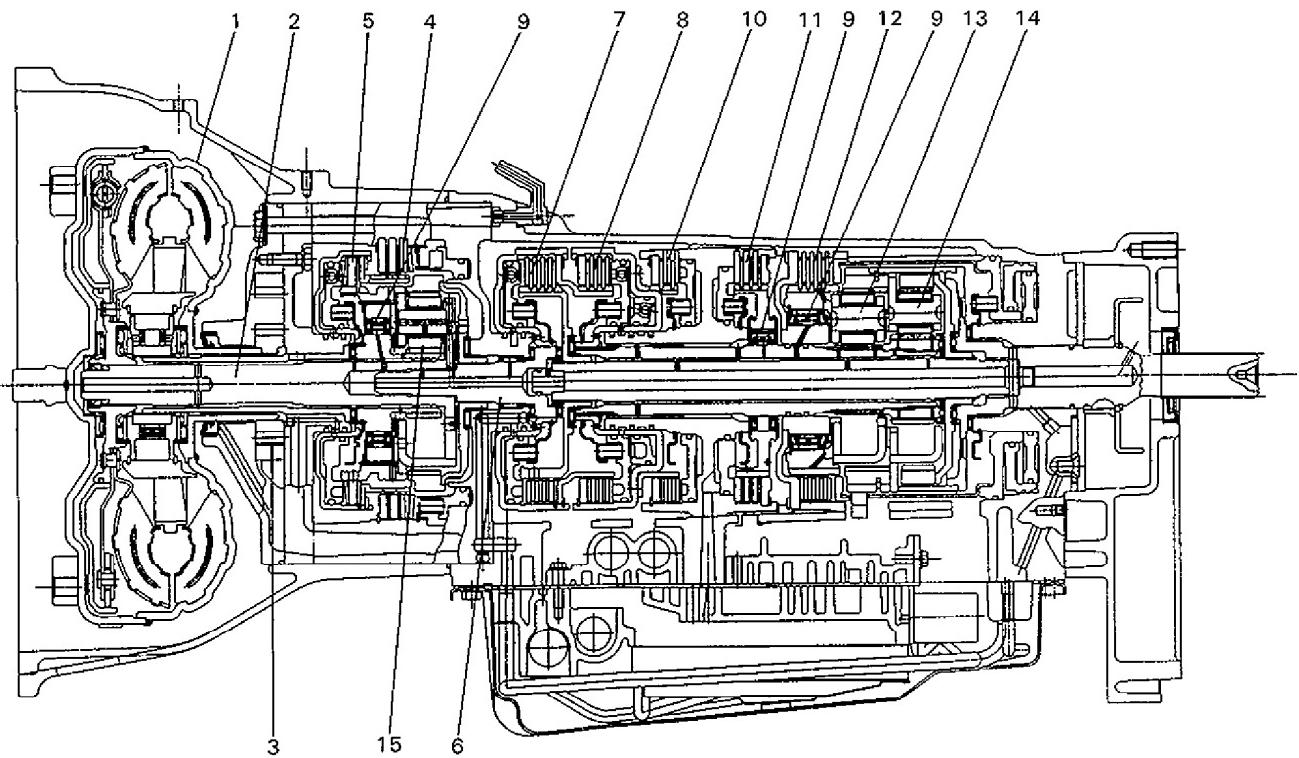
AUTOMATIC TRANSMISSION (4 A/T)

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GENERAL DESCRIPTION

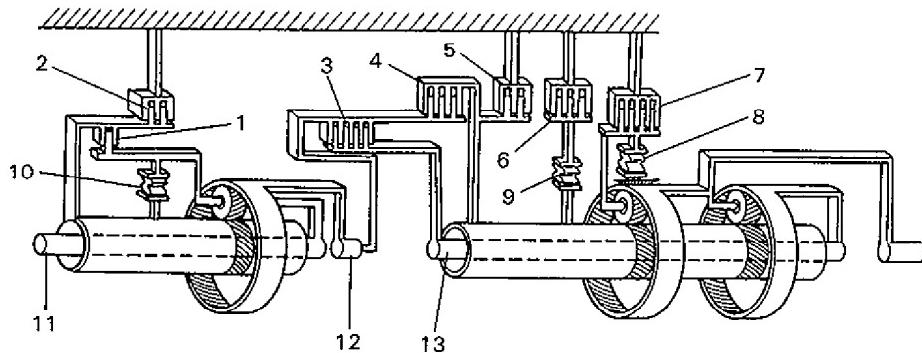
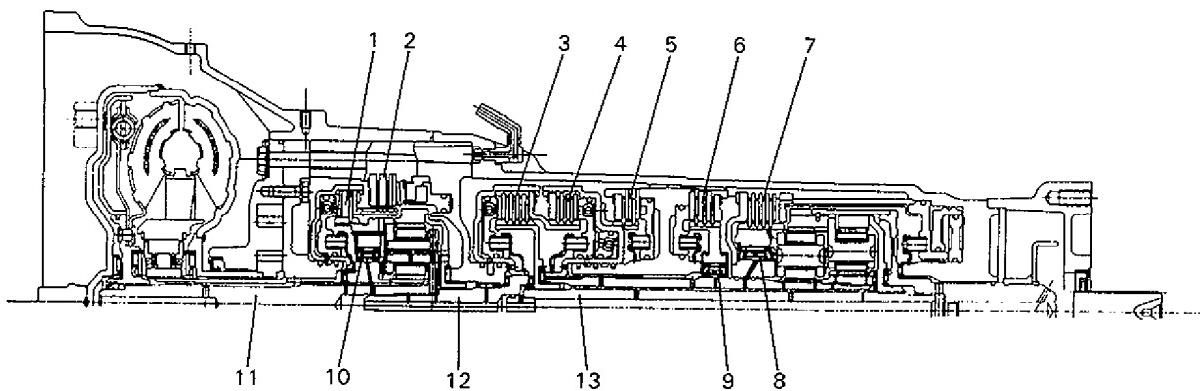
This automatic transmission is a full automatic type with 3-speed plus overdrive (O/D). The torque converter is a 3-element, 1-step and 2-phase type and is equipped with an electronically controlled lock-up mechanism. The gear shift device consists of 3 sets of planetary gear units, 3 disc type clutches, 4 disc type brakes and 3 one-way clutches. The gear shift is done by selecting one of 6 positions ("P", "R", "N", "D", "2" and "L") by means of the select lever installed on the floor. On the shift knob, there is an overdrive (O/D) cut switch which allows shift-up to the overdrive mode (except at 4L) and shift-down from the overdrive mode. Also, by using the P/N change switch located on the console box, it is possible to select the gear shift timing of 2 modes, normal and power.



1. Torque converter
2. Overdrive input shaft
3. Oil pump
4. Overdrive brake
5. Overdrive clutch
6. Forward clutch input shaft
7. Forward clutch
8. Direct clutch
9. One-way clutch
10. Second coast brake
11. Second brake
12. Reverse brake
13. Front planetary gear
14. Rear planetary gear
15. Overdrive planetary gear

Item		Specifications	
Torque converter	Type Stall torque ratio	3-element, 1-step, 2-phase type (with lock-up mechanism) 2.4	
Oil pump	Type Drive system	Trochoid type oil pump Engine driven	
Gear shift device	Type	Forward 4-step, reverse 1-step planetary gear type	
	Shift position	"P" range "R" range "N" range "D" range (O/D ON) "D" range (O/D OFF) "2" range "L" range	Gear in neutral, output shaft fixed, engine start Reverse Gear in neutral, engine start Forward 1st ↔ 2nd ↔ 3rd ↔ 4th (O/D) automatic gear shift Forward 1st ↔ 2nd ↔ 3rd ← 4th automatic gear shift (Normal model) Forward 1st ↔ 2nd ← 3rd automatic gear shift (Power mode) Forward 2nd ← 3rd automatic gear shift and fixed at 2nd gear Forward 1st ← 2nd reduction, and fixed at 1st gear
	Gear ratio	1st (low gear) 2nd (second gear) 3rd (top gear) 4th (overdrive gear) Reverse (reverse gear)	2.826 1.493 1.000 0.730 2.703
	Control elements	Wet type multi-disc clutch 3 sets Wet type multi-disc brake 4 sets One-way clutch 3 sets	
	Transfer	Hi: 1.000 Lo: 1.816	
	Final gear reduction ratio (Differential)	5.125	
Lubrication	Lubrication system	Force feed system by oil pump	
Cooling	Cooling system	Radiator assisted cooling (water-cooled)	
Fluid used		DEXRON-II	

CLUTCH/BRAKE FUNCTIONS



- 1. Overdrive clutch
- 2. Overdrive brake
- 3. Forward clutch
- 4. Direct clutch
- 5. Second coast brake
- 6. Second brake
- 7. Reverse brake
- 8. One-way clutch No.2
- 9. One-way clutch No.1
- 10. Overdrive one-way clutch
- 11. Overdrive input shaft
- 12. Forward clutch input shaft
- 13. Intermediate shaft

Part Name	Function
Overdrive clutch	Meshes overdrive carrier and overdrive sun gear.
Overdrive brake	Fixes overdrive sun gear.
Overdrive one-way clutch	Meshes overdrive carrier and overdrive sun gear only when driven by engine.
Forward clutch	Meshes input shaft and intermediate shaft.
Direct clutch	Meshes input shaft with front sun gear and rear sun gear.
Second coast brake	Fixes front sun gear and rear sun gear.
Second brake	Fixes outer race of one-way clutch No.1, to prevent front sun gear and rear sun gear from turning counterclockwise (reverse direction of engine input rotation direction).
Reverse brake	Fixes front planetary carrier.
One-way clutch No.1	Prevents front sun gear and rear sun gear from turning counterclockwise only when second brake is at work.
One-way clutch No.2	Prevents front planetary carrier from turning counterclockwise.

TABLE OF COMPONENT OPERATION

Element Shift position \	Solenoid No.1-A	Solenoid No.1-B	O/D clutch	Forward clutch	Direct clutch		O/D brake	Second coast brake	Second brake	Reverse brake		O/D one-way clutch	One-way clutch No.1	One-way clutch No.2
					Inner piston	Outer piston				Inner piston	Outer piston			
P	○	X	○	—	—	—	—	—	—	—	—	○	—	—
R	○	X	○	—	○	○	—	—	—	○	○	○	—	—
N	○	X	○	—	—	—	—	—	—	—	○	○	—	—
D	1st gear	○	X	○	○	—	—	—	—	—	—	○	—	○
	2nd gear	○	○	○	○	—	—	—	—	○	—	○	○	—
	3rd gear	X	○	○	○	—	○	—	—	○	—	○	—	—
	O/D	X	X	—	○	—	○	○	—	○	—	—	—	—
2	1st gear	○	X	○	○	—	—	—	—	—	—	○	—	○
	2nd gear	○	○	○	○	—	—	—	○	○	—	—	○	—
	3rd gear (Fail safe)	X	○	○	○	—	○	—	—	○	—	○	—	—
L	1st gear	○	X	○	○	—	—	—	—	—	○	○	○	—
	2nd gear (Fail safe)	○	○	○	○	—	—	—	○	○	—	—	○	—

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○: ON, X: OFF

POWER FLOW

1. "D" OR "2" RANGE FIRST GEAR

The driving force of the overdrive (O/D hereinafter) input shaft is transmitted to the O/D planetary carrier. The O/D planetary carrier, O/D sun gear and O/D ring gear are connected together by the O/D clutch and O/D one-way clutch and they turn clockwise as one unit.

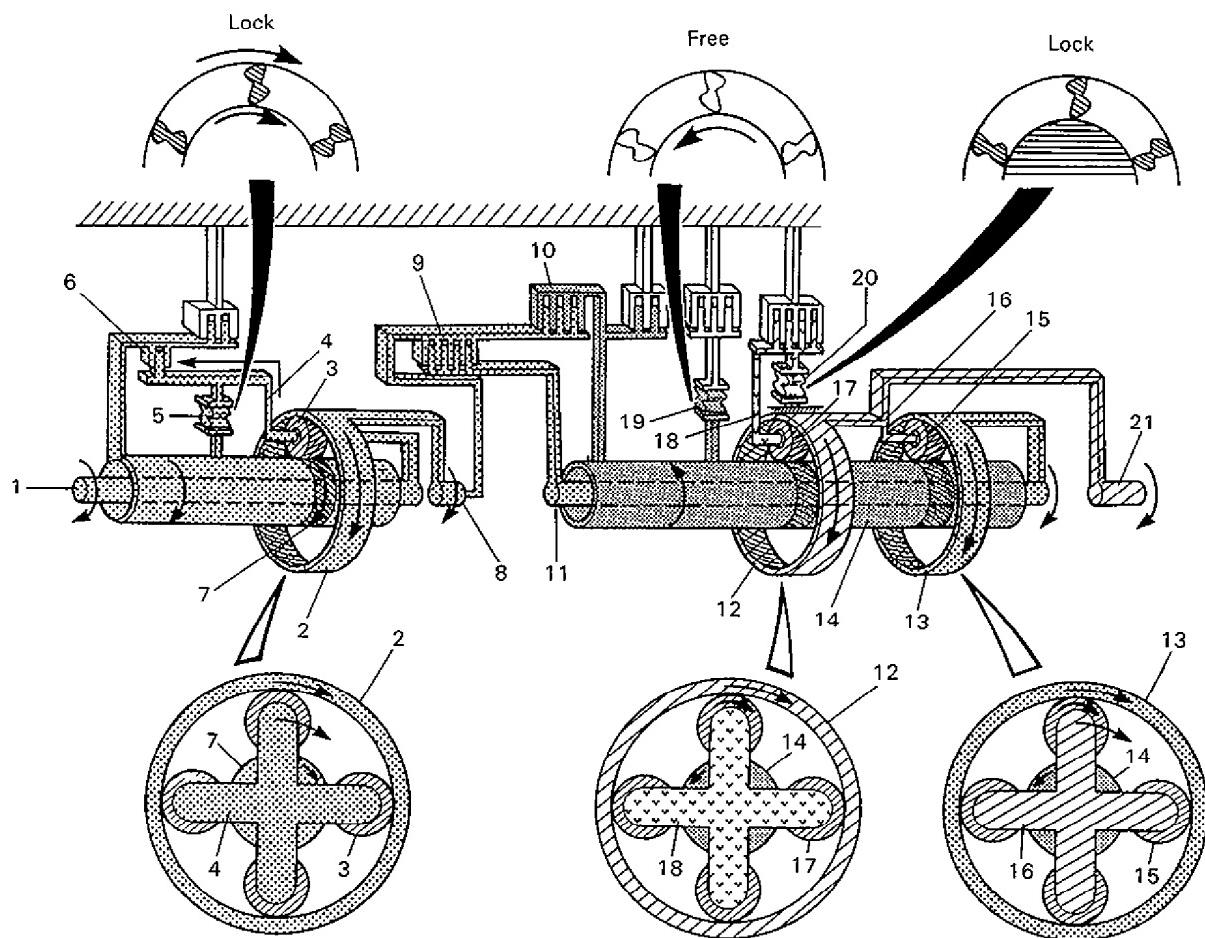
As the forward clutch (F/C hereinafter) input shaft is incorporated with the O/D planetary ring gear, revolution of the O/D input shaft is transmitted directly to the F/C input shaft. Then it is further transmitted through the forward clutch to the intermediate shaft and the rear planetary ring gear which is incorporated with the intermediate shaft. Thus, the rear pinion revolves while turning on its axis both clockwise and the output shaft connected to the rear planetary carrier revolves clockwise.

On the other hand, the sun gears engaged with the rear planetary pinion receives counterclockwise revolution and causes the front planetary pinion to turn clockwise. In this state, the front planetary carrier is under the counterclockwise revolution force but as the carrier is prevented from turning due to the operation of the one-way clutch No.2, clockwise revolution is transmitted to the output shaft.

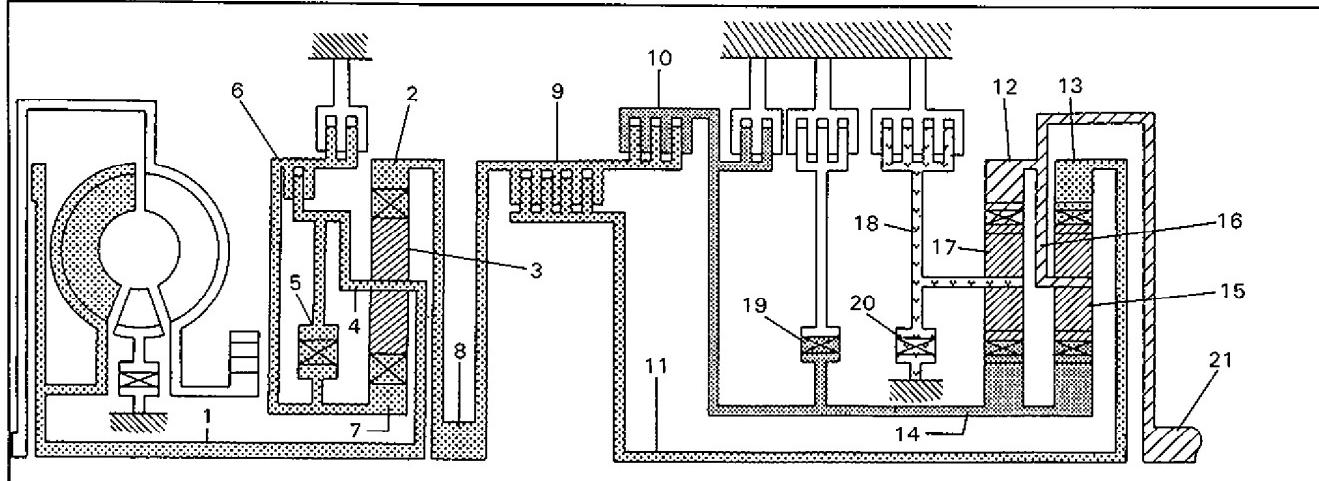
When reducing the speed, the one-way clutch No.2 spins and the front planetary carrier turns clockwise because the front planetary ring gear revolution is higher than the front planetary pinion revolution (on its axis). Thus, the reverse torque from the driving wheel is not transmitted to the engine and therefore the engine brake does not work.

Operating Clutches and Solenoids

Overdrive clutch	Solenoid No.1—A (Shift solenoid—A) ON
Overdrive one-way clutch	Solenoid No.1—B (Shift solenoid—B) OFF
Forward clutch	
One-way clutch No.2	



Input to pinion	Output from pinion	Fixed	Pinion	Input to pinion (partial)



- | | | |
|----------------------------|-------------------------------|-----------------------------|
| 1. O/D input shaft | 8. F/C input shaft | 15. Rear planetary pinion |
| 2. O/D planetary ring gear | 9. Forward clutch | 16. Rear planetary carrier |
| 3. O/D planetary pinion | 10. Direct clutch | 17. Front planetary pinion |
| 4. O/D planetary carrier | 11. Intermediate shaft | 18. Front planetary carrier |
| 5. O/D one-way clutch | 12. Front planetary ring gear | 19. One-way clutch No.1 |
| 6. O/D clutch | 13. Rear planetary ring gear | 20. One-way clutch No.2 |
| 7. O/D sun gear | 14. Sun gear (Front & Rear) | 21. Output shaft |

2. "D" RANGE SECOND GEAR

The driving force of the O/D input shaft is transmitted to the O/D planetary carrier. The O/D planetary carrier, O/D sun gear and O/D ring gear are connected together by the O/D clutch and O/D one-way clutch and they turn clockwise as one unit.

As the F/C input shaft is integrated with the O/D planetary ring gear, revolution of the O/D input shaft is transmitted directly to the F/C input shaft. Then it is further transmitted through the forward clutch to the intermediate shaft and the rear planetary ring gear which is incorporated with the intermediate shaft. As the sun gears are fixed by the second brake, the rear planetary carrier and the output shaft incorporated with it turn clockwise at a higher speed than in the first gear.

When reducing the speed, the one-way clutch No.2 spins and the front planetary carrier turns clockwise as in the first gear. Thus, the reverse torque from the driving wheel is not transmitted to the engine and therefore the engine brake does not work.

Operating Clutches/Brake and Solenoids

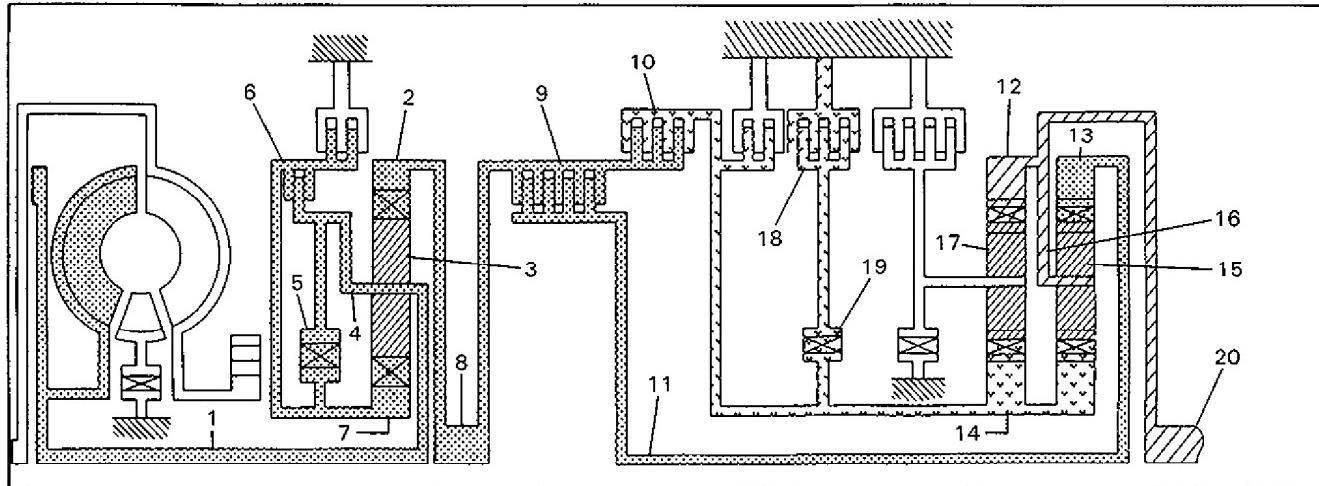
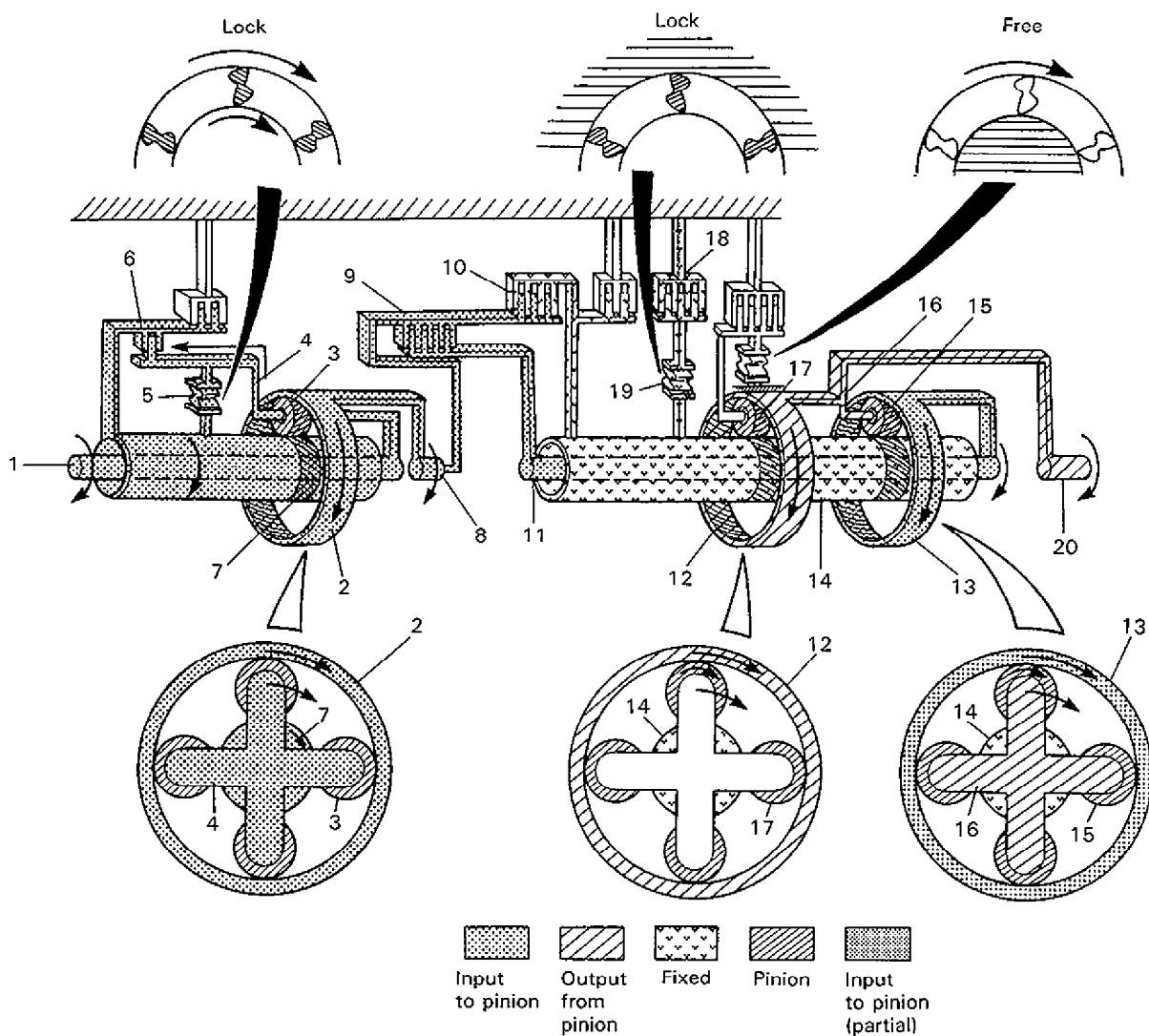
Overdrive clutch Shift solenoid—A ON

Overdrive one-way clutch Shift solenoid—B ON

Forward clutch

Second brake

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- | | | |
|----------------------------|-------------------------------|----------------------------|
| 1. O/D input shaft | 8. F/C input shaft | 15. Rear planetary pinion |
| 2. O/D planetary ring gear | 9. Forward clutch | 16. Rear planetary carrier |
| 3. O/D planetary pinion | 10. Direct clutch | 17. Front planetary pinion |
| 4. O/D planetary carrier | 11. Intermediate shaft | 18. Second brake |
| 5. O/D one-way clutch | 12. Front planetary ring gear | 19. One-way clutch No. 1 |
| 6. O/D clutch | 13. Rear planetary ring gear | 20. Output shaft |
| 7. O/D sun gear | 14. Sun gears (Front & Rear) | |

3. "D" RANGE THIRD GEAR

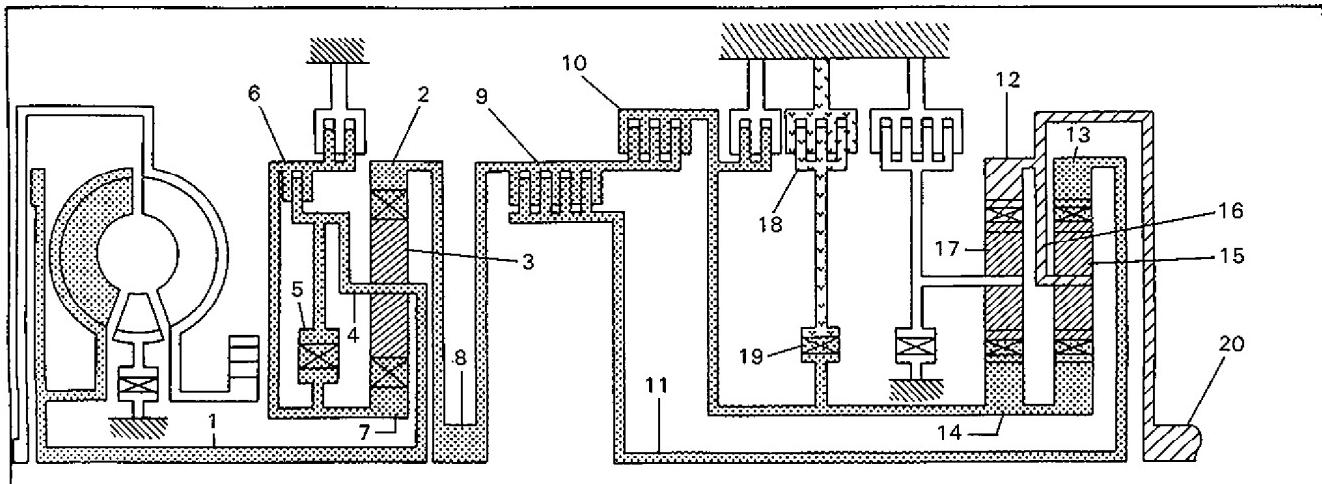
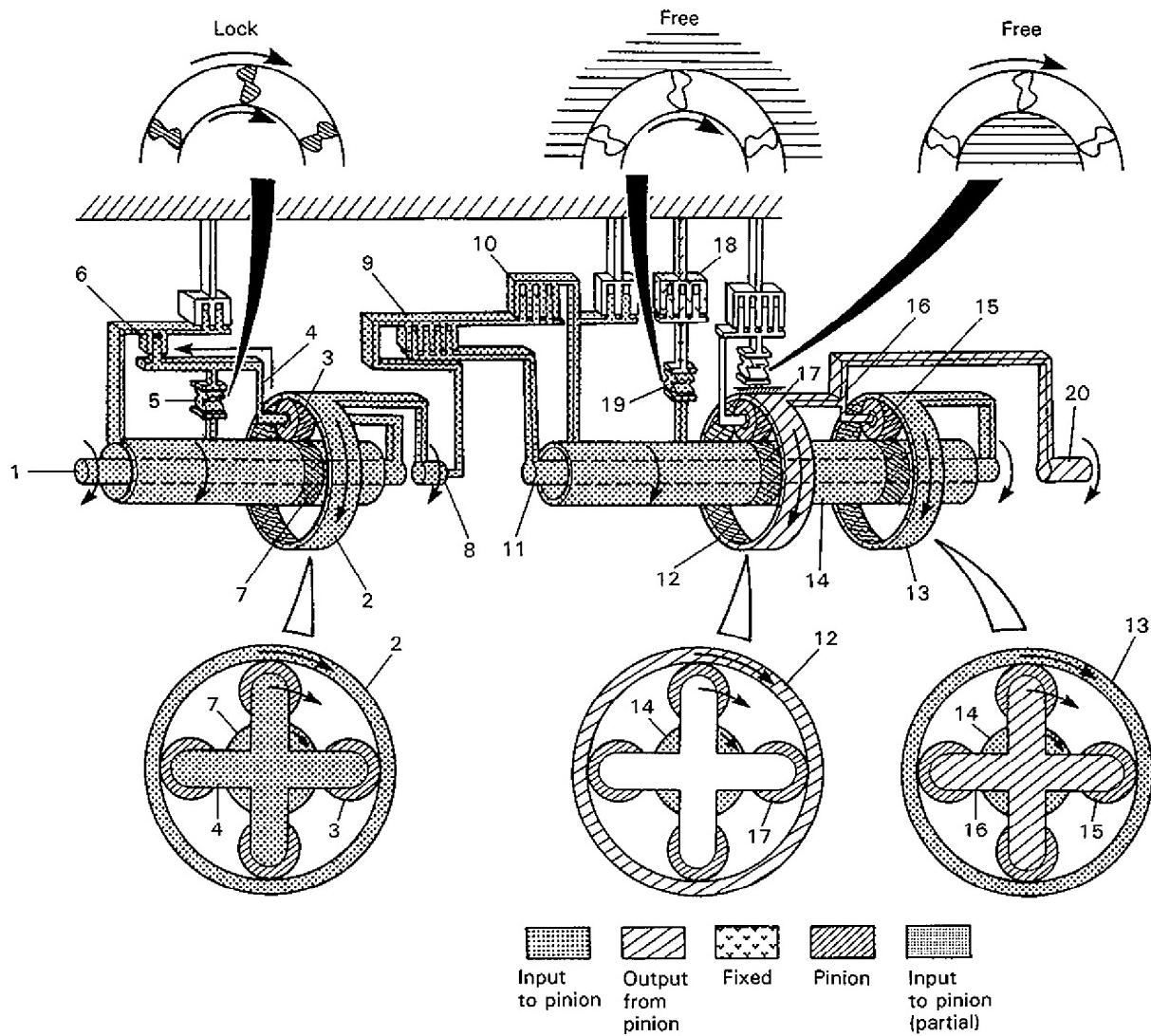
The driving force of the O/D input shaft is transmitted to the O/D planetary carrier. The O/D planetary carrier, O/D sun gear and O/D planetary ring gear are connected together by the O/D clutch and O/D one-way clutch and they turn clockwise as one unit.

As the F/C input shaft is integrated with the O/D planetary ring gear, revolution of the O/D input shaft is transmitted directly to the F/C input shaft. At this point, the forward clutch operates to transmit the revolution to the intermediate shaft and rear planetary ring gear which is incorporated with it and the direct clutch operates to transmit the same revolution to the sun gears. As a result, the rear planetary carrier is connected with the rear planetary ring gear and sun gears and turn clockwise as one unit and so does the output shaft. In this state, the revolution of the output shaft is the same as that of the O/D input shaft.

When reducing the speed, the rear planetary carrier tries to turn at a higher speed than the rear planetary ring gear, but as the rear planetary gear is connected directly with the engine and the rear planetary carrier and rear planetary ring gear are connected directly, a force to prevent such speed increase occurs and the engine brake works.

Operating Clutches/Brake and Solenoids

Overdrive clutch	Shift solenoid—A OFF
Overdrive one-way clutch	Shift solenoid—B ON
Forward clutch	
Direct clutch	
Second brake	



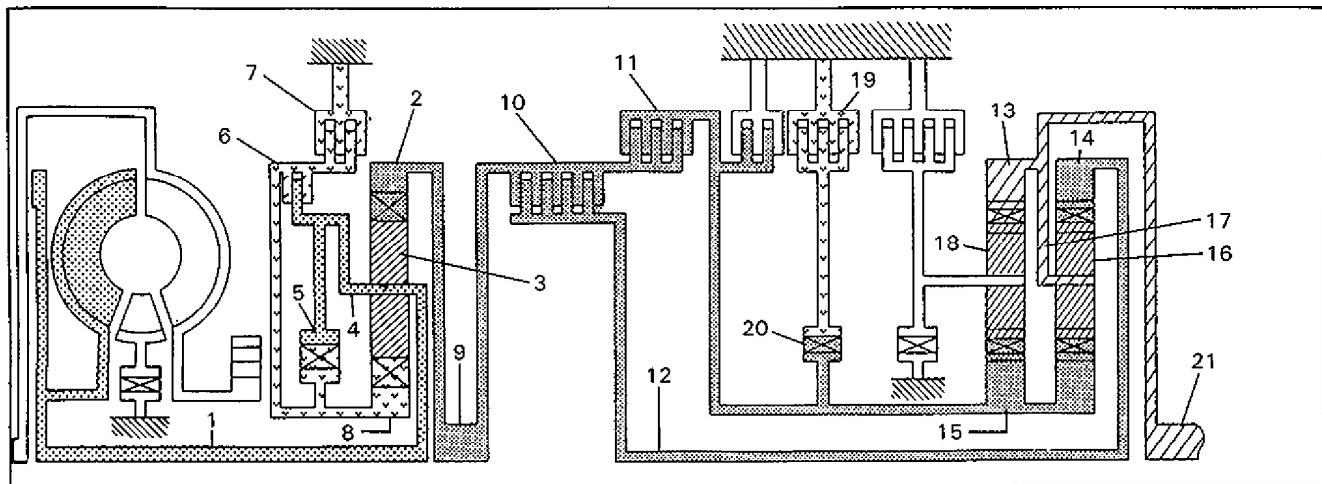
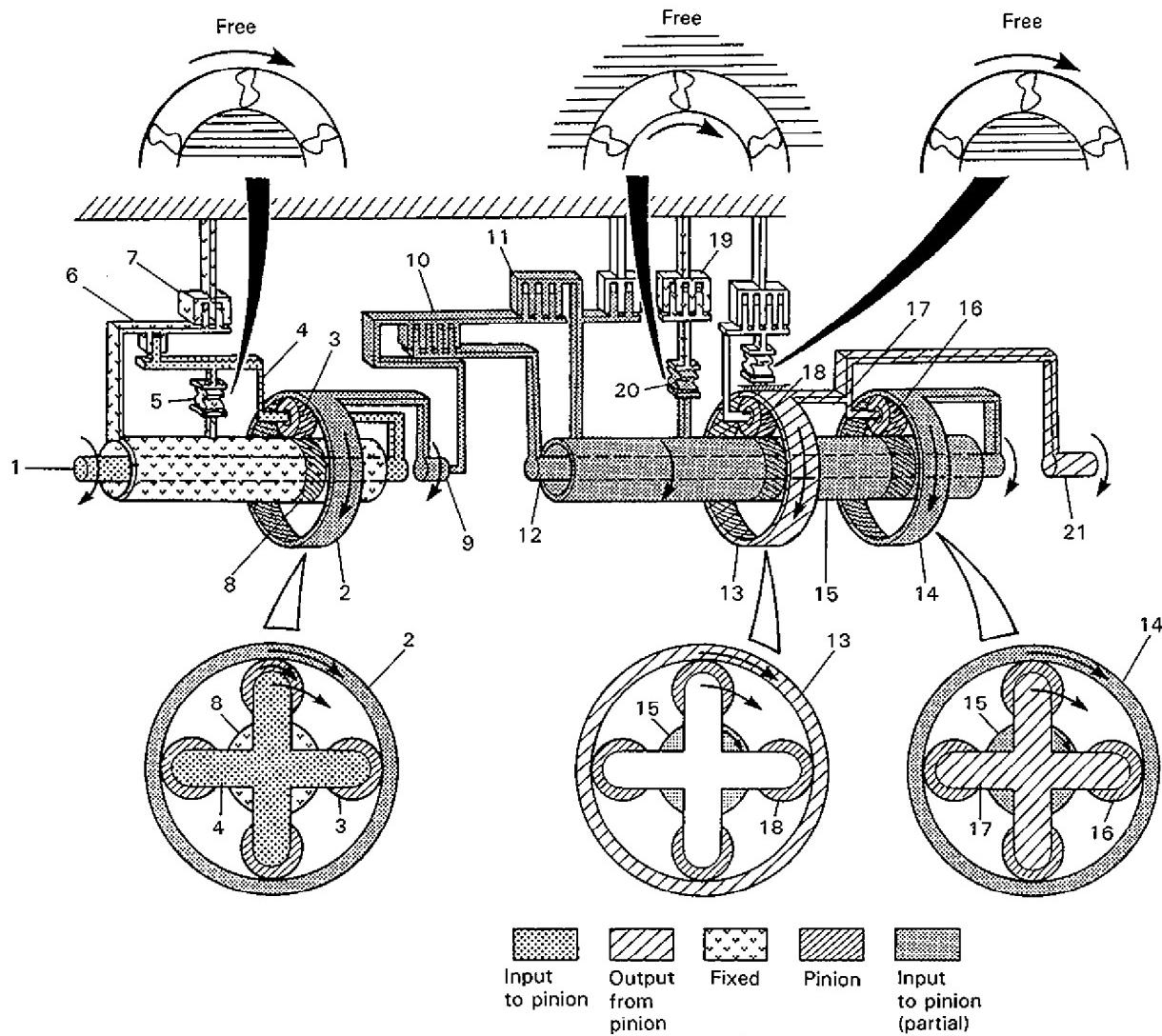
4. "D" RANGE FOURTH GEAR (OVERDRIVE)

The driving force of the O/D input shaft is transmitted to the O/D planetary carrier. Here the O/D brake operates to fix the O/D sun gear and the O/D pinion revolves and rotates on its axis both clockwise to transmit revolution to the O/D planetary ring gear. In this state, the O/D planetary ring gear turns at a higher speed than in 1st, 2nd or 3rd gear by the amount increased because the O/D pinion rotates on its axis. As the F/C input shaft is integrated with the O/D planetary ring gear, revolution of the O/D input shaft is transmitted directly to the F/C input shaft. At this point, the forward clutch operates to transmit the revolution to the intermediate shaft and rear planetary ring gear which is incorporated with it and the direct clutch operates to transmit the same revolution to the sun gears. As a result, the rear planetary carrier is connected to the rear planetary ring gear and sun gears and turn clockwise and so does the output shaft. In this state, the output shaft turns at a higher speed than in the 3rd gear by the amount increased at the O/D planetary carrier.

When reducing the speed, the rear planetary carrier tries to turn at a higher speed than the rear planetary ring gear, but as the rear planetary gear is connected directly with the engine and the rear planetary carrier and rear planetary ring gear are connected directly, a force to prevent such speed increase occurs and the engine brake works.

Operating Clutches/Brakes and Solenoids

Overdrive brake	Shift solenoid—A OFF
Forward clutch	Shift solenoid—B OFF
Direct clutch	
Second brake	



1. O/D input shaft
2. O/D planetary ring gear
3. O/D planetary pinion
4. O/D planetary carrier
5. O/D one-way clutch
6. O/D clutch
7. O/D brake

8. O/D sun gear
9. F/C input shaft
10. Forward clutch
11. Direct clutch
12. Intermediate shaft
13. Front planetary ring gear
14. Rear planetary ring gear

15. Sun gears (Front & Rear)
16. Rear planetary pinion
17. Rear planetary carrier
18. Front planetary pinion
19. Second brake
20. One-way clutch No.1
21. Output shaft

5. "2" RANGE SECOND GEAR

The driving force of the O/D input shaft is transmitted to the output shaft through the same passage as in the "D" range second gear and when reducing the speed, the second coast brake operates to activate the engine brake.

When reducing the speed, the rear planetary carrier tries to turn at a higher speed than that transmitted from the planetary ring gear and tries to turn the sun gears clockwise. However, as the second coast brake operates to fix the sun gears, increase in revolution of the rear planetary carrier is all transmitted to the planetary ring gear. In this state, the rear planetary ring gear is directly connected with the engine and actuates the engine brake.

Operating Clutches/Brakes and Solenoids

Overdrive clutch Shift solenoid—A ON

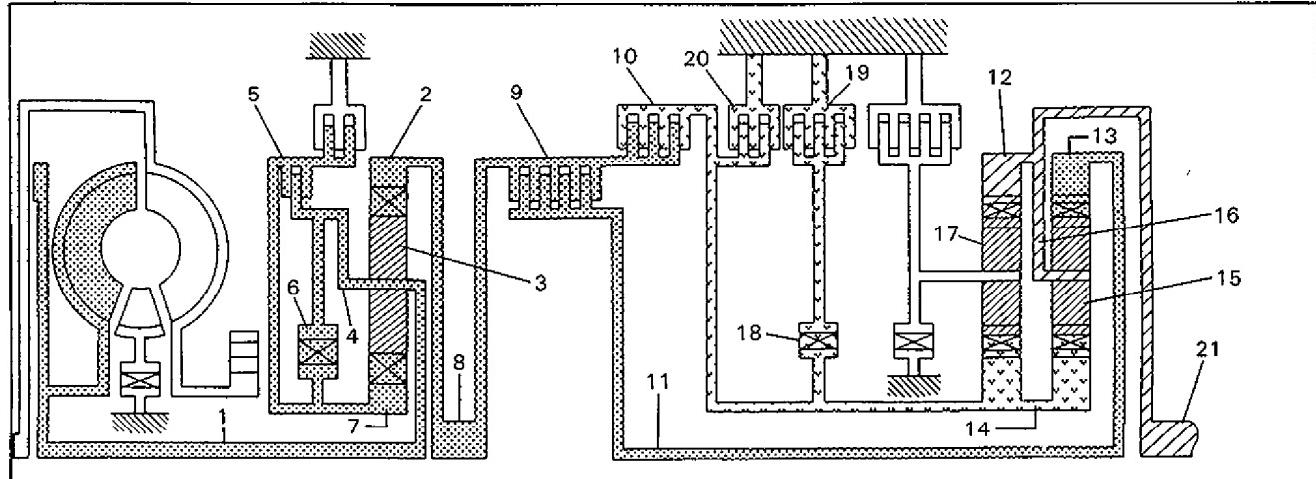
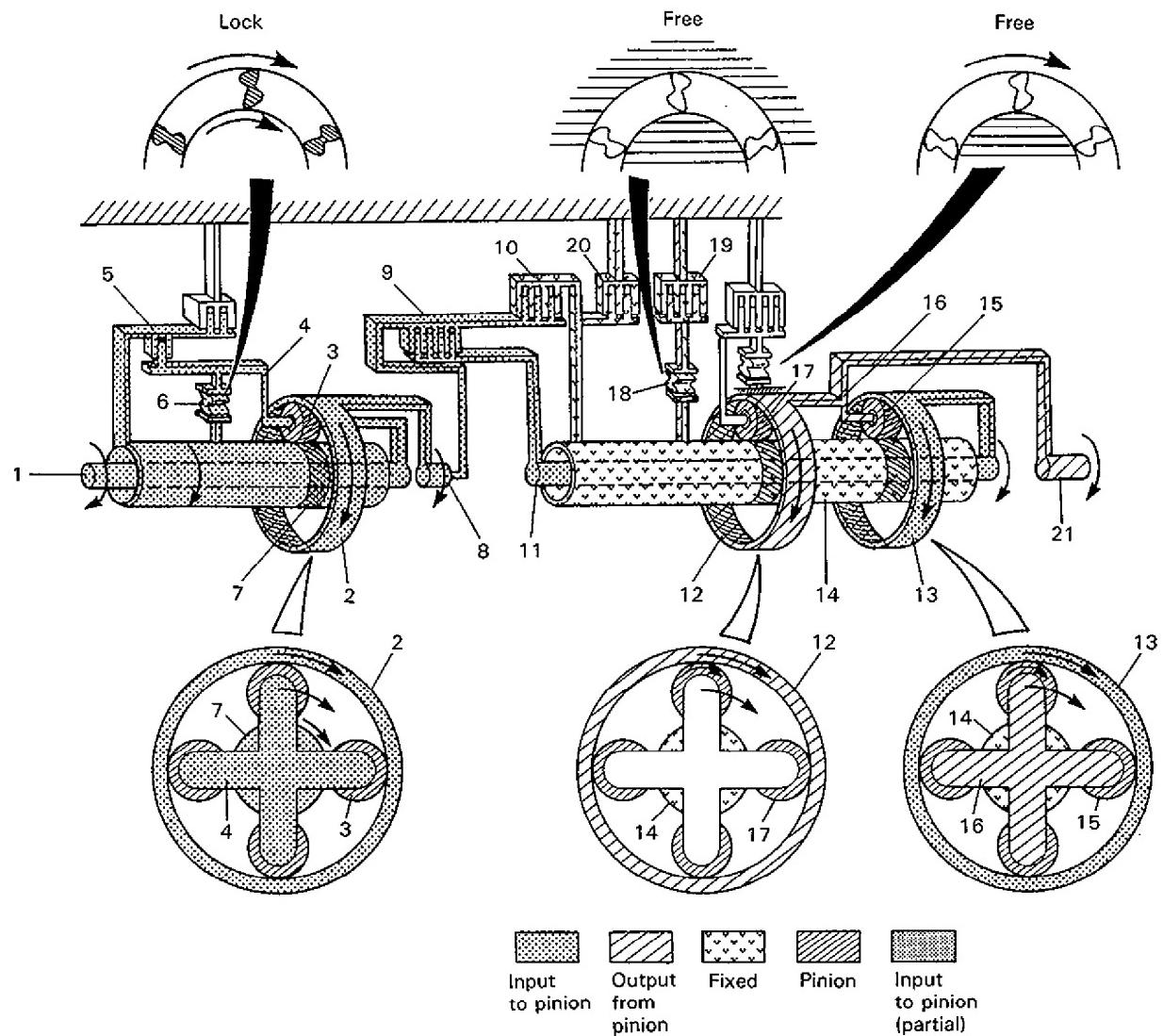
Overdrive one-way clutch Shift solenoid—B ON

Forward clutch

Second coast brake

Second brake

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1. O/D input shaft
2. O/D planetary ring gear
3. O/D planetary pinion
4. O/D planetary carrier
5. O/D clutch
6. O/D one-way clutch
7. O/D sun gear

8. F/C input shaft
9. Forward clutch
10. Direct clutch
11. Intermediate shaft
12. Front planetary ring gear
13. Rear planetary ring gear
14. Sun gears (Front & Rear)

15. Rear planetary pinion
16. Rear planetary carrier
17. Front planetary pinion
18. One-way clutch No.1
19. Second brake
20. Second coast brake
21. Output shaft

6. "L" RANGE

The driving force of the O/D input shaft is transmitted to the output shaft through the same passage as in the "D" range first gear and when reducing the speed, the reverse brake operates to activate the engine brake.

When reducing the speed, the planetary ring gear tries to turn at a higher speed than that transmitted from the front pinion and tries to turn the front planetary carrier clockwise. However, as the reverse brake operates to fix the front planetary carrier, increase in revolution of the front planetary ring gear is all transmitted through the front pinion to the sun gears. Increase in speed of the sun gears is transmitted to the rear planetary ring gear through the rear pinion and as a result, the engine brake comes into operation.

Operating Clutches/Brake and Solenoids

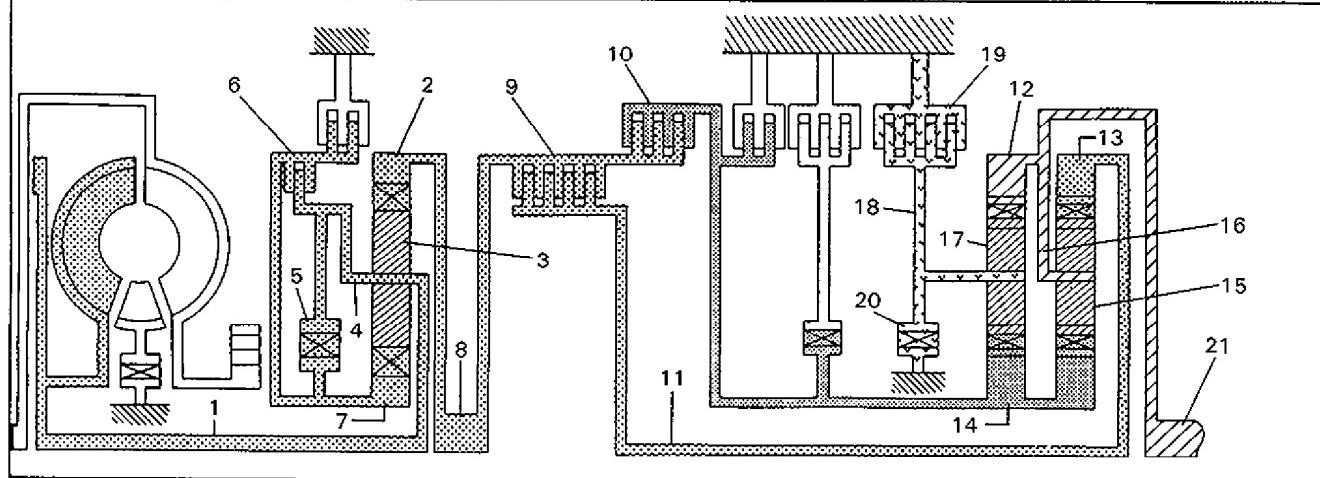
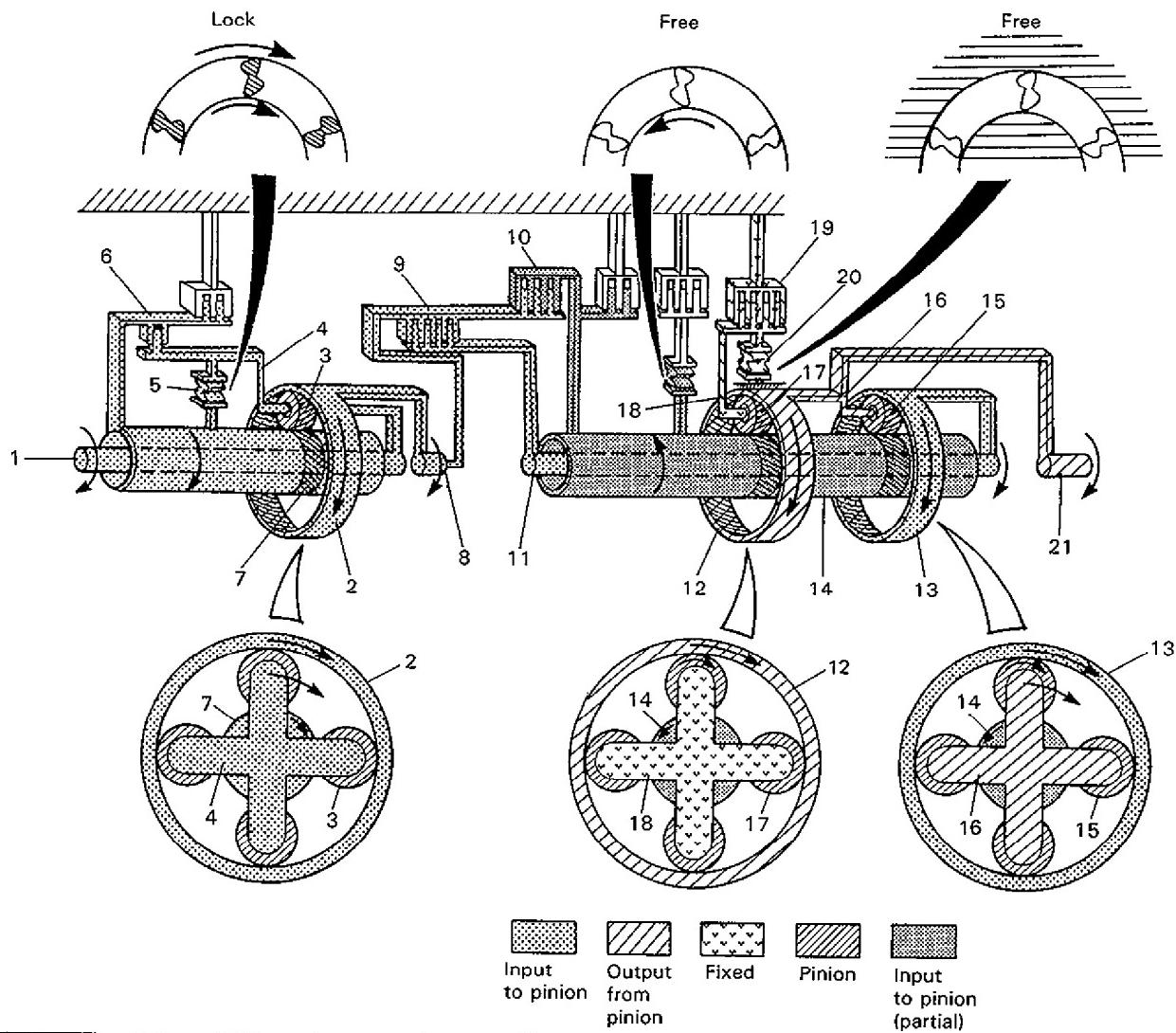
Overdrive clutch Shift solenoid—A ON

Overdrive one-way clutch Shift solenoid—B OFF

Forward clutch

Reverse brake

60A50-7B1-16-1S



1. O/D input shaft
 2. O/D planetary ring gear
 3. O/D planetary pinion
 4. O/D planetary carrier
 5. O/D one-way clutch
 6. O/D clutch
 7. O/D sun gear
 8. F/C input shaft
 9. Forward clutch
 10. Direct clutch
 11. Intermediate shaft
 12. Front planetary ring gear
 13. Rear planetary ring gear
 14. Sun gears (Front & Rear)

15. Rear planetary pinion
 16. Rear planetary carrier
 17. Front planetary pinion
 18. Front planetary carrier
 19. Reverse brake
 20. One-way clutch No.2
 21. Output shaft

7. "R" RANGE

The driving force of the O/D input shaft is transmitted to the O/D planetary carrier. The O/D planetary carrier, O/D sun gear and O/D ring gear are connected together by the O/D clutch and O/D one-way clutch and they turn clockwise as one unit.

As the F/C input shaft is integrated with the O/D planetary ring gear, clockwise revolution of the O/D input shaft is transmitted directly to the F/C input shaft. Then the direct clutch operates to transmit revolution of the O/D planetary ring gear to the sun gears and the front pinion. Here, the front pinion turns counterclockwise on its axis without revolving because of the reverse brake and causes the output shaft to turn counterclockwise.

Operating Clutches/Brake and Solenoids

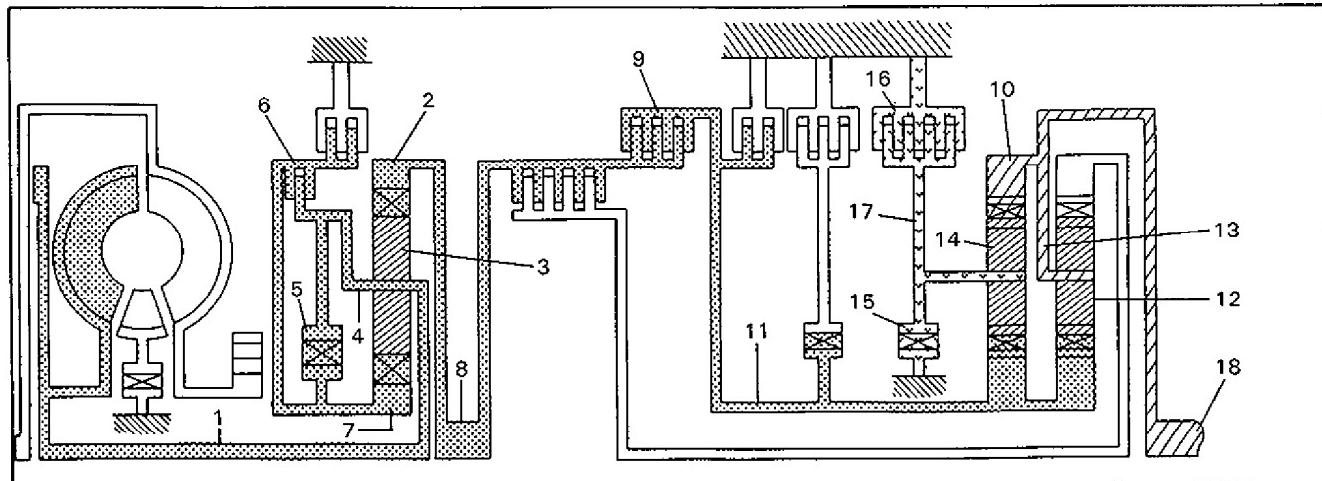
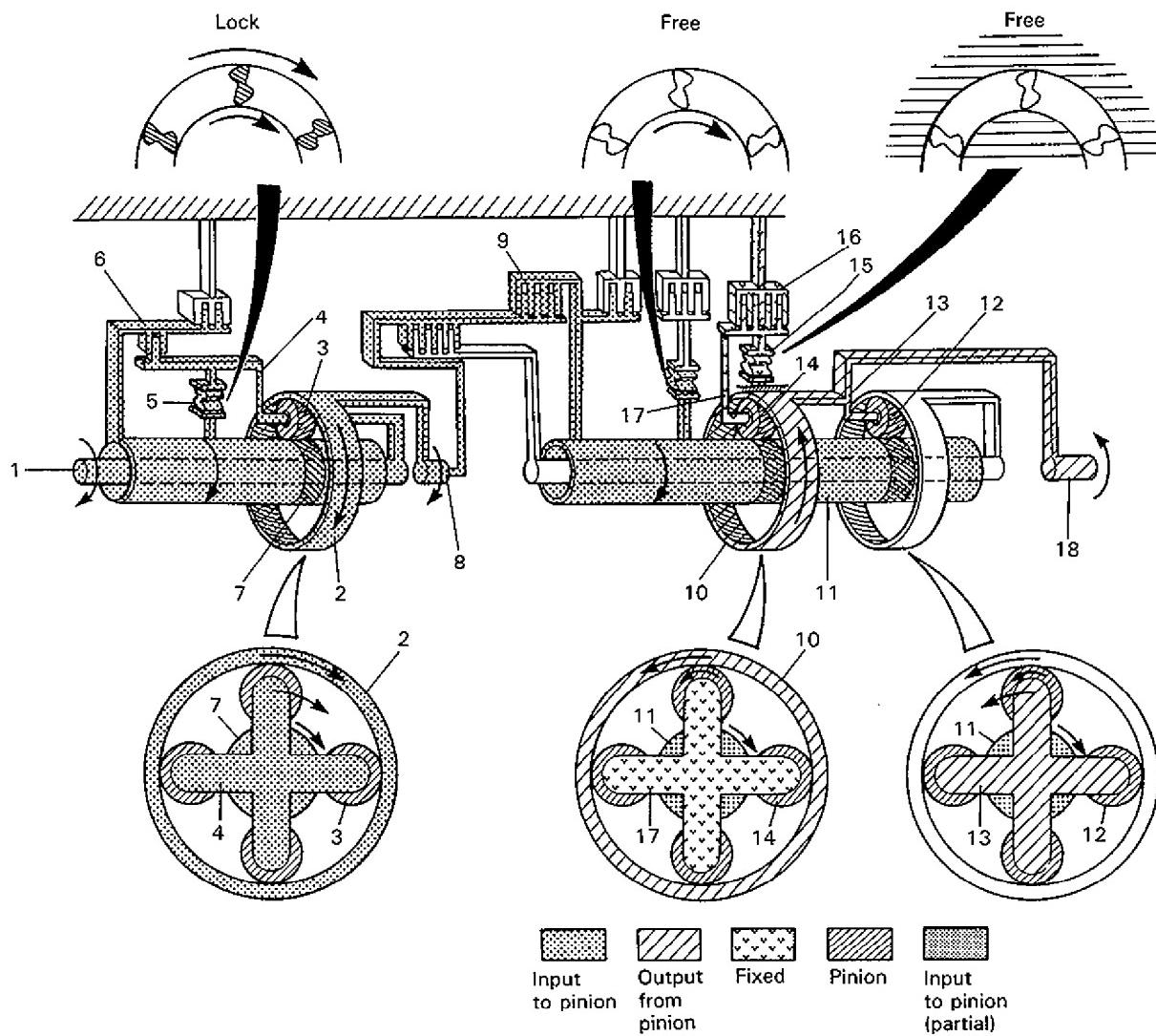
Overdrive clutch Shift solenoid—A ON

Overdrive one-way clutch Shift solenoid—B OFF

Direct clutch

Reverse brake

60A50-7B1-18-1S



1. O/D input shaft
2. O/D planetary ring gear
3. O/D planetary pinion
4. O/D planetary carrier
5. O/D one-way clutch
6. O/D clutch

7. O/D sun gear
8. F/C input shaft
9. Direct clutch
10. Front planetary ring gear
11. Sun gears (Front & Rear)
12. Rear planetary pinion

13. Rear planetary carrier
14. Front planetary pinion
15. One-way clutch No.2
16. Reverse brake
17. Front planetary carrier
18. Output shaft

8. "N" OR "P" RANGE

The driving force of the O/D input shaft is transmitted to the O/D planetary carrier. The O/D carrier, O/D sun gear and O/D planetary ring gear are connected together by the O/D clutch and O/D one-way clutch and they turn clockwise as one unit.

As the F/C input shaft is integrated with the O/D ring gear, revolution of the O/D input shaft is transmitted directly to the F/C input shaft. At this point, as neither forward clutch nor direct clutch is at work, the power is not transmitted rearward.

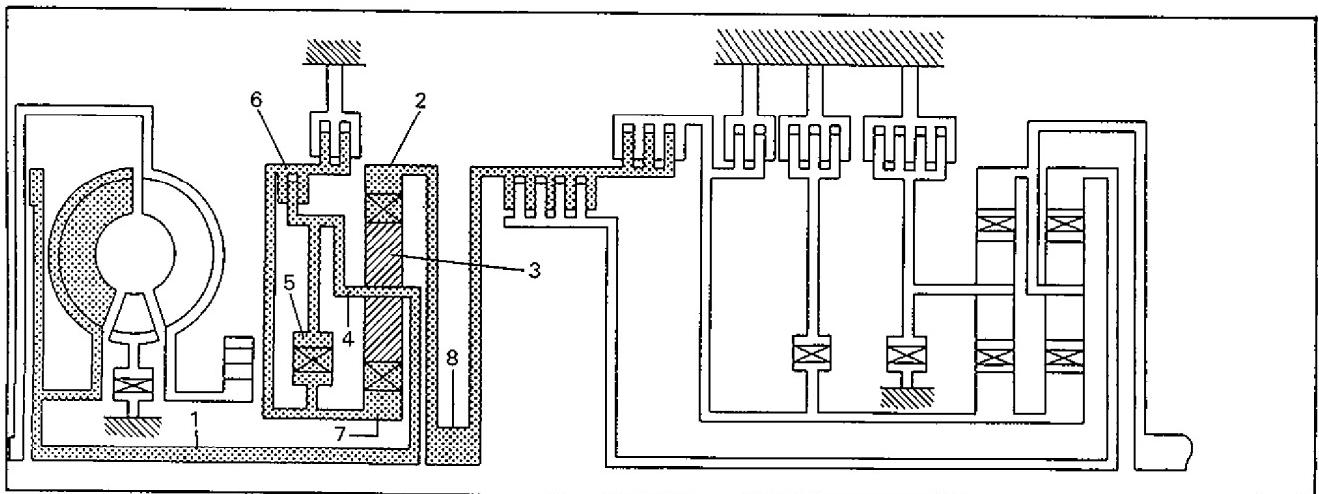
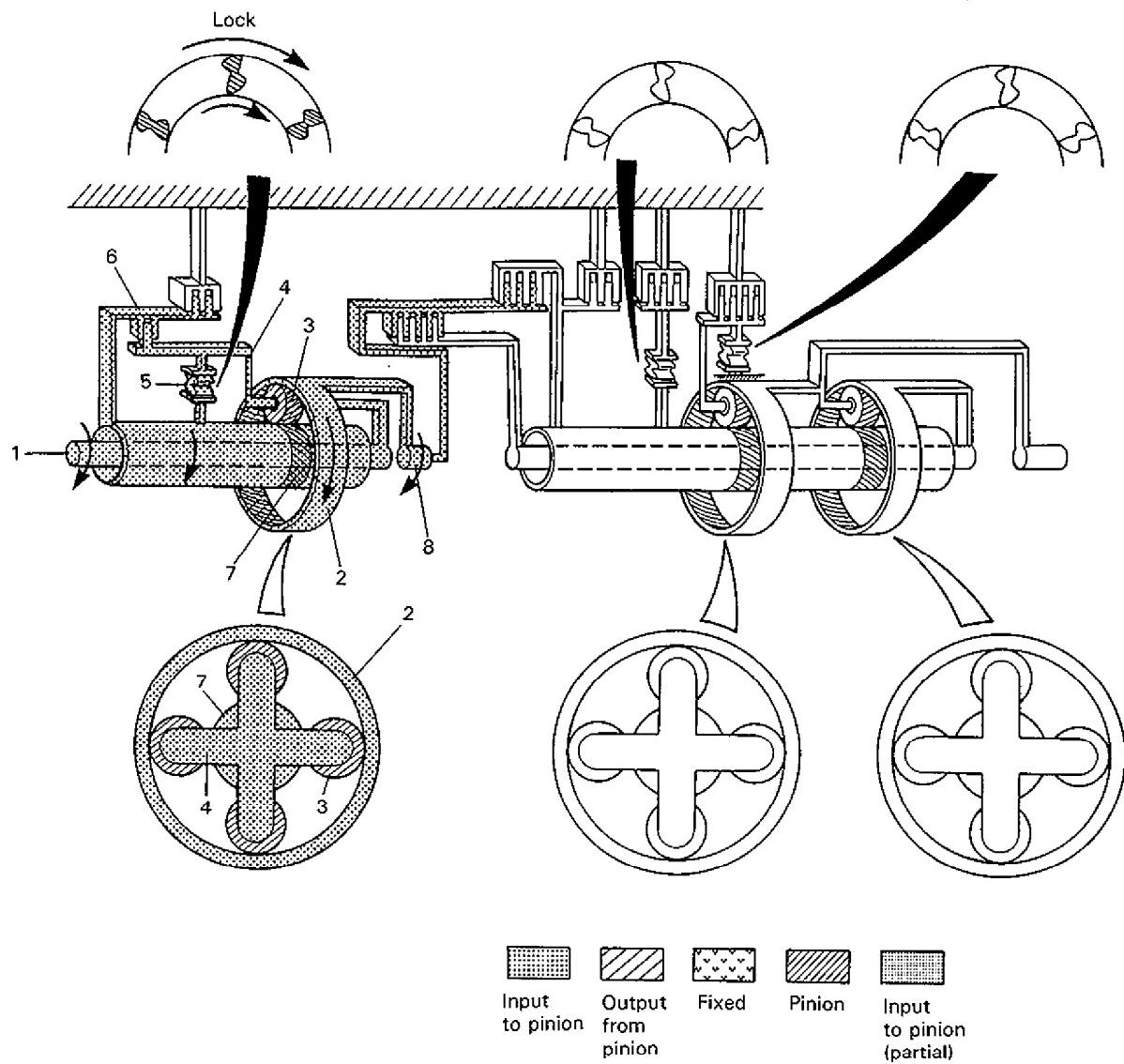
In the "P" range, the parking rod pawl fits in the groove in the front planetary gear mechanically to prevent the output shaft from turning.

Operating Clutches and Solenoids

Overdrive clutch Shift solenoid—A ON

Overdrive one-way clutch Shift solenoid—B OFF

60A50-7B1-20-1S



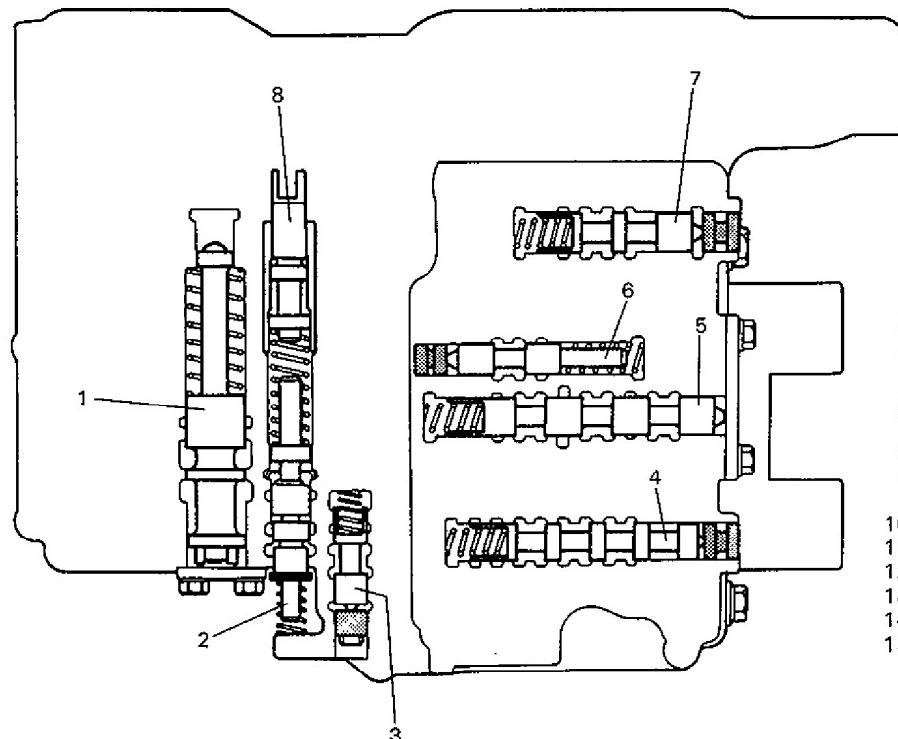
- | | |
|----------------------------|--------------------|
| 1. O/D input shaft | 7. O/D sun gear |
| 2. O/D planetary ring gear | 8. F/C input shaft |
| 3. O/D planetary pinion | |
| 4. O/D planetary carrier | |
| 5. O/D one-way clutch | |
| 6. O/D clutch | |

FLUID PRESSURE CONTROL

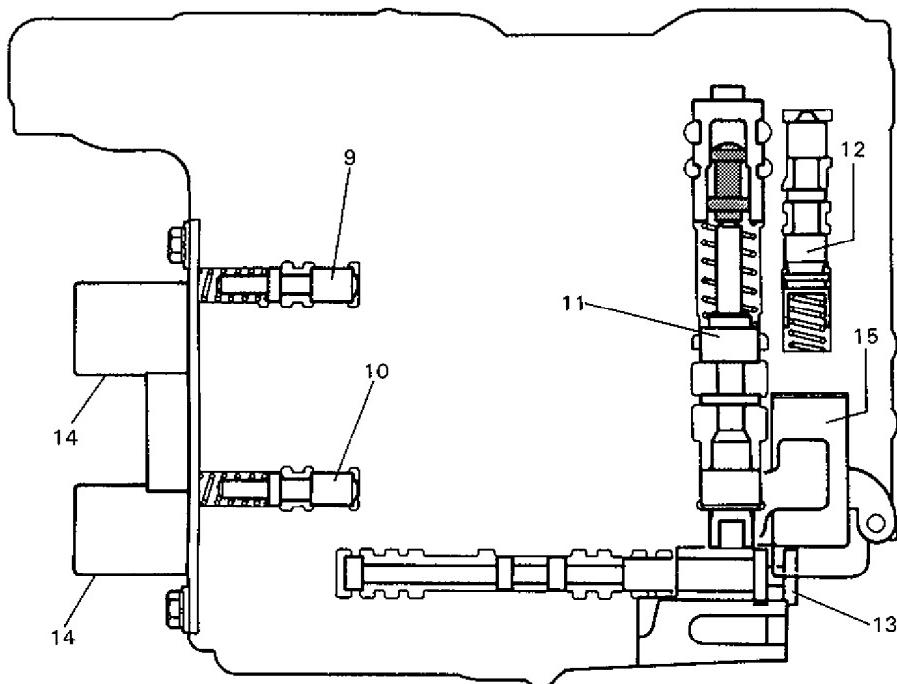
VALVE BODY

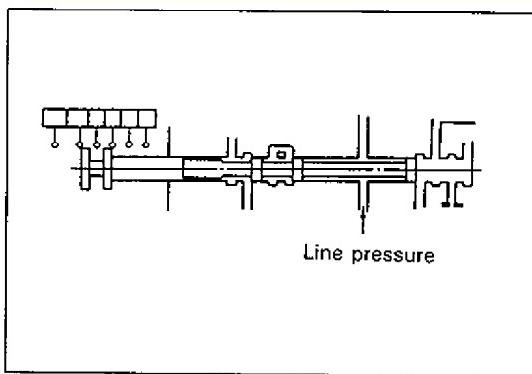
The valve body with built-in valves to control fluid pressure is located in the oil pan. These valves are connected through fluid passages.

Upper side

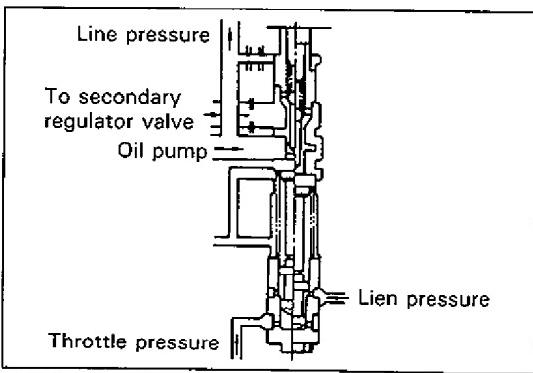


Lower side

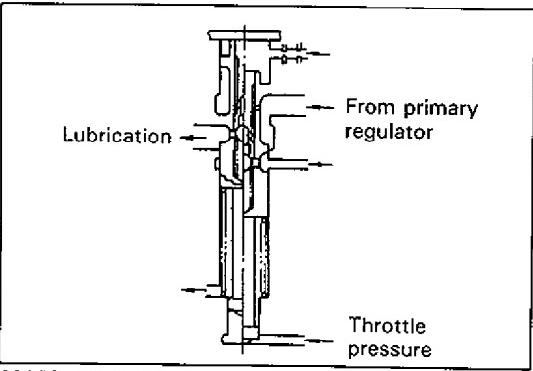




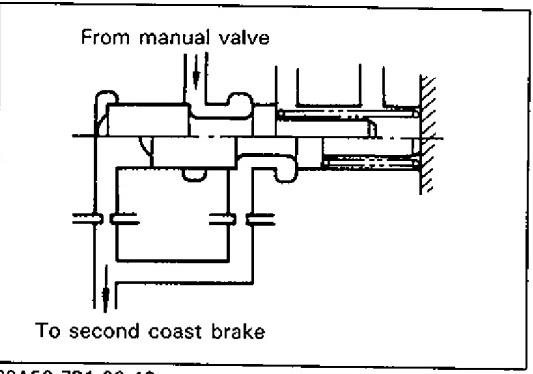
60A50-7B1-23-1S



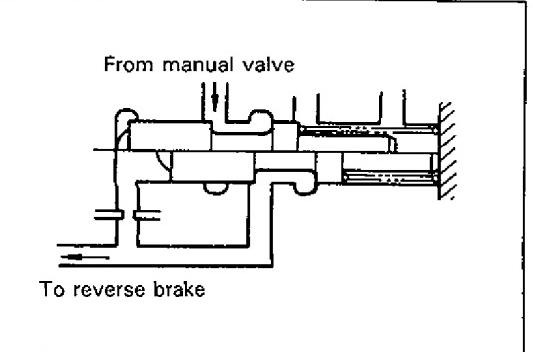
60A50-7B1-23-2S



60A50-7B1-23-3S



60A50-7B1-23-4S



VALVE FUNCTION

Manual Valve

This valve switches the fluid passage. As it is connected with the shift lever at the driver's seat through a linkage, it selects a fluid passage corresponding to each range of "P", "R", "N", "D", "2" or "L" as selected by the shift lever.

Primary Regulator Valve

This valve adjusts the fluid pressure to each element automatically so that an optimum pressure is obtained based on the vehicle speed and engine load (throttle valve opening) then unnecessary power loss by the pump is avoided.

Secondary Regulator Valve

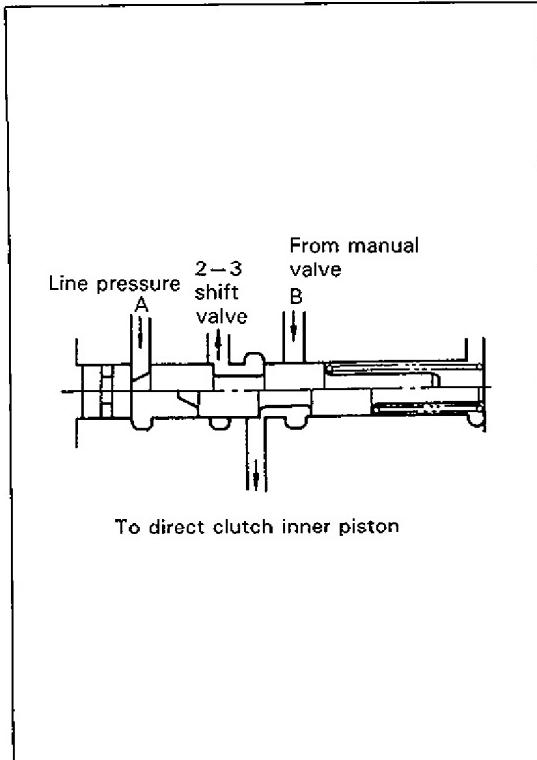
This valve adjusts the converter pressure, lubricating fluid pressure and cooler pressure so that an optimum pressure is obtained based on the vehicle speed and engine load (throttle valve opening) then.

Intermediate Coast Modulator Valve

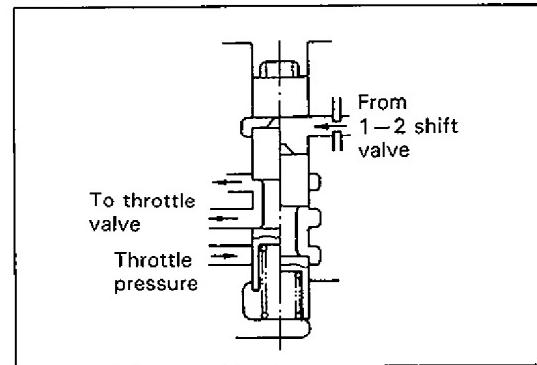
This valve adjusts the line pressure and operates the second coast brake piston so as to relieve a shock which occurs when the engine brake works in the "2" range second gear.

Low Coast Modulator Valve

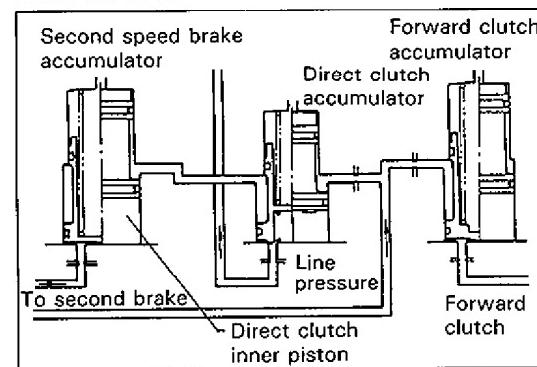
This valve adjusts the line pressure applied to it in the "L" range to the low fluid pressure (low modulator pressure) which is then applied through the low coast shift valve to the reverse brake so that a shock is relieved.



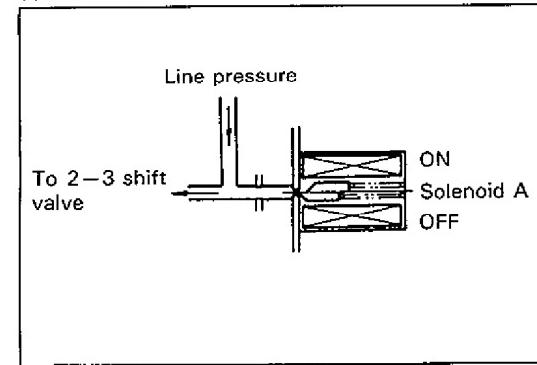
60A50-7B1-24-1S



60A50-7B1-24-3S



60A50-7B1-24-4S



60A50-7B1-24-5S

Reverse Clutch Sequence Valve

This valve, controlled by the line pressure which is applied to the direct clutch outer piston, relieves a shock which occurs when the shift lever is shifted to "R" range. In "R" range, the line pressure is applied to A and B passages simultaneously. However, it is not until the fluid pressure in the A passage which is applied to this valve, or the line pressure on the direct clutch piston, exceeds the valve spring force that the B passage opens. Thus, the direct clutch inner piston operates later than the direct clutch piston.

In the "D" range 3rd gear, only the outer piston operates because the B passage is closed by the manual valve.

Cut Back Valve

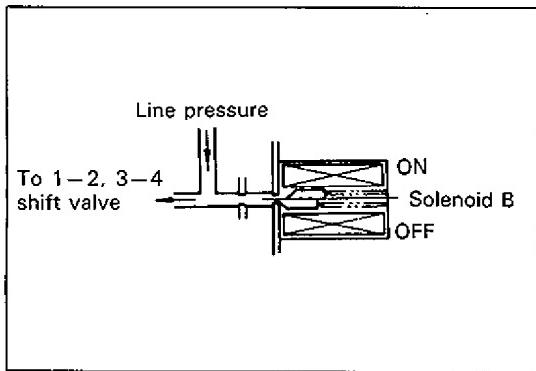
This valve adjusts the cut back pressure which is applied to the throttle valve. It is controlled by the line pressure from 1-2 shift valve and throttle pressure. When the cut back pressure is applied to the throttle valve, the throttle pressure is reduced to prevent unnecessary power loss.

Accumulator

An accumulator is installed to the forward clutch, direct clutch and second brake to relieve a shock which occurs when each of them operates. There is an area difference between the working pressure side and the back pressure side of the accumulator piston, with the former larger. The line pressure is applied to the back pressure side all the time and the piston is pushed down. When the passage to the working pressure side piston opens and the line pressure is applied, the piston is pushed upward gradually to relieve the shock at the gear shift.

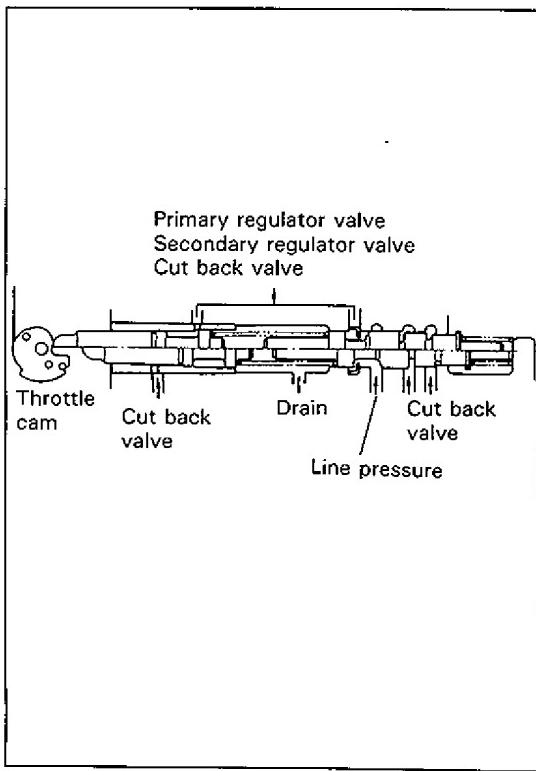
Solenoid No.1 (Shift solenoid A & B)

As the solenoid No.1-A (Shift solenoid-A) is turned ON and OFF, 2-3 gear shift takes place automatically.



60A50-7B1-25-1S

As solenoid No.1-B (Shift solenoid-B) is turned ON and OFF, 1-2 and 3-4 gear shifts take place automatically.



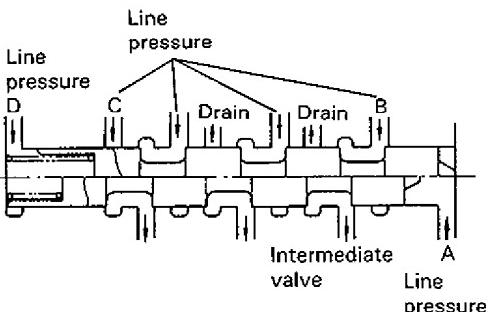
60A50-7B1-25-2S

Throttle Valve

The throttle valve produces the throttle pressure which corresponds to the engine load, that is, how far the accelerator pedal is depressed. Movement of the accelerator pedal is transmitted through the throttle cable connected to the accelerator pedal to the throttle cam which pushes the down shift plug according to how far the pedal is depressed.

Then 2 springs in the front and rear are compressed to move the throttle valve. As the valve opens the line pressure passage, the throttle pressure occurs. As this throttle pressure also acts on the back of the valve, the throttle valve is pushed back by it and when the down shift plug comes to the position where the tension of two springs is balanced, the throttle valve closes the line pressure passage.

In this way, the throttle pressure causes rise of the fluid pressure corresponding to the throttle valve opening. This fluid pressure is applied to the primary regulator valve and secondary regulator valve to adjust the line pressure.



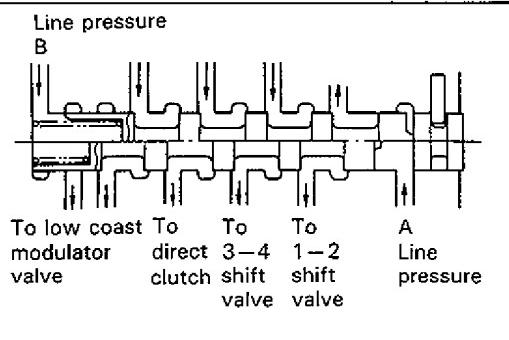
1-2 Shift Valve

As the shift solenoid B is turned ON and OFF, switching between the first gear and second gear is controlled automatically.

In the first gear, the solenoid No.1-B is turned OFF and the line pressure in the A passage is applied to the valve to move so as to close the passage to the second brake. When the solenoid No.1-B turns ON, the line pressure in the A passage is drained and the valve moves by the spring force to open the passage to the second brake, resulting in the second gear.

In "2" and "L" ranges, the line pressure is applied through the B passage and it acts on the second coast brake through the intermediate modulator valve only when the valve is in the second position to actuate the engine brake in the second gear. In "L" range, the line pressure is applied through the C passage and it acts on the reverse brake only when the valve is in the first gear position to actuate the engine brake in the first gear.

60A50-7B1-26-1S



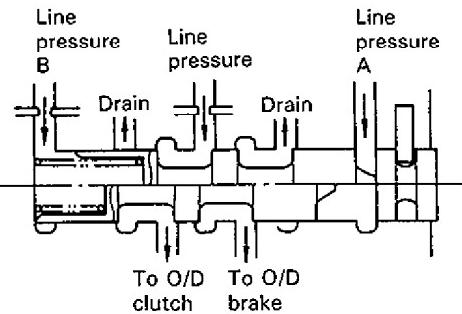
2-3 Shift Valve

As the shift solenoid-A is turned ON and OFF, the gear change between the second gear and the third gear is controlled automatically.

In the second gear, the shift solenoid-A is turned ON and the line pressure in the A passage is drained and the passage to the direct clutch is closed.

When the shift solenoid-A is turned OFF, the line pressure from the A passage is applied to the valve to open the passage to the direct clutch, resulting in the third gear.

60A50-7B1-26-3S



3-4 Shift Valve

As the shift solenoid—B is turned ON and OFF, switching between the third gear and O/D gear is controlled automatically. In the third gear, as the shift solenoid—B is turned ON and the line pressure in the A passage is drained, the passage to the O/D clutch is opened and the passage to the O/D brake is closed.

When the shift solenoid—B is turned OFF, the line pressure in the A passage is applied to the valve to move, thereby closing the O/D clutch passage and opening the O/D brake passage is opened, resulting in the O/D gear.

Also, in the first gear, the shift solenoid—B is turned OFF. As the line pressure is applied to the valve through the A passage as well as through the B passage, it is held stationary and thus the passage is not switched between the O/D clutch and the O/D brake.

FLUID PRESSURE OPERATION

1. "D" or "2" Range First Gear

The discharge pressure from the oil pump is regulated to the line pressure by the primary regulator valve and applied to the manual valve, throttle valve, each accumulator and lock-up control valve.

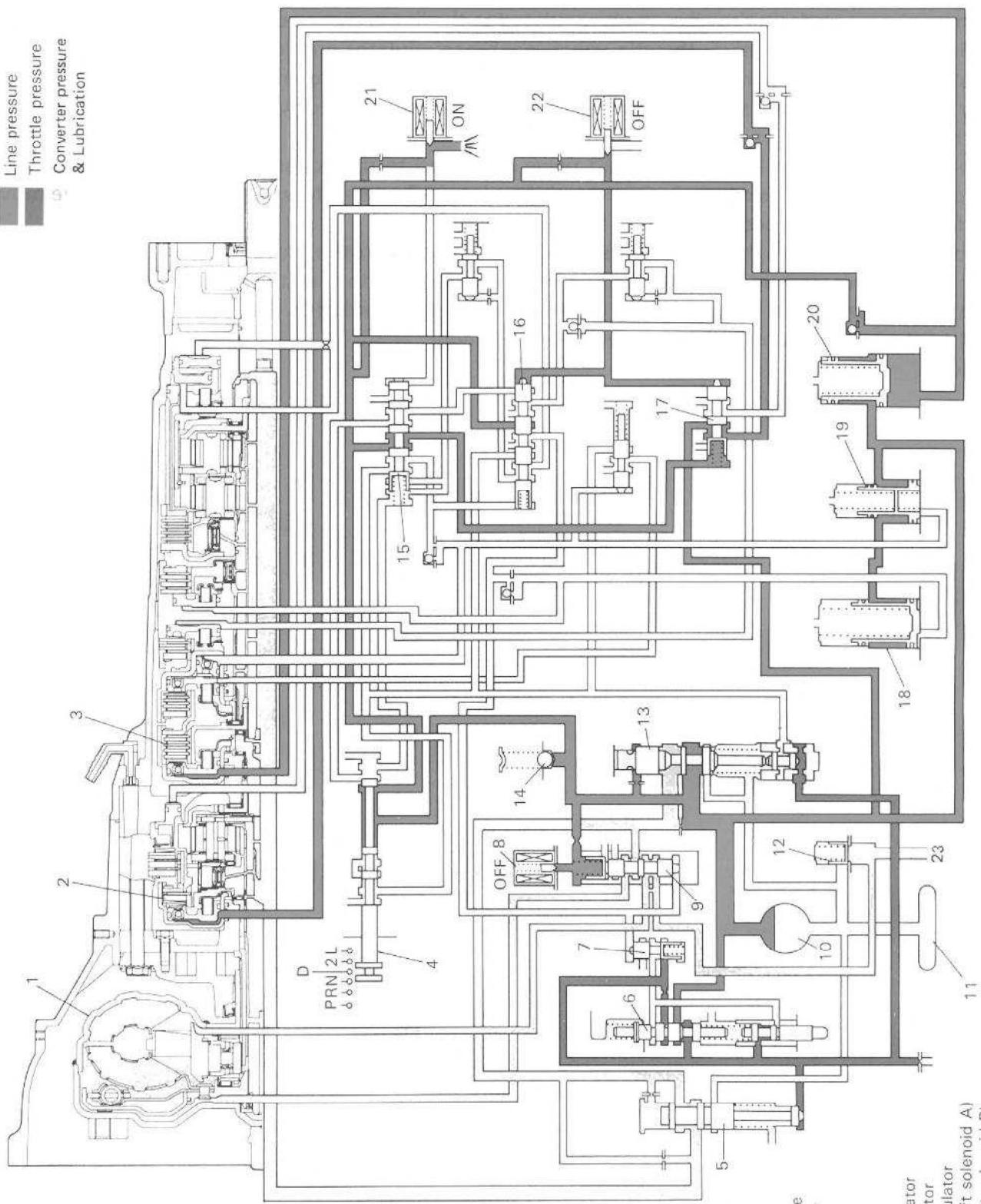
The line pressure fed to the manual valve works on the accumulator to engage the forward clutch. On the other hand, the line pressure passes through the primary regulator valve and 3–4 shift valve to engage the O/D clutch.

The line pressure fed to the throttle valve is converted into the throttle pressure, works on the primary regulator valve again to adjust the pressure to the line pressure suitable for the throttle opening.

Also, the throttle pressure fed to the secondary regulator valve is converted into the secondary regulator pressure, fed to the torque converter and used for lubrication.

60A50-7B1-28-1\$

Line pressure
Throttle pressure
Converter pressure & Lubrication



1. Torque converter
2. O/D clutch
3. Forward clutch
4. Manual valve
5. Secondary regulator valve
6. Throttle valve
7. Cut back valve
8. Solenoid No. 2 (Lock-up solenoid)
9. Lock-up control valve
10. Oil pump
11. Strainer
12. Oil cooler by-pass valve
13. Primary regulator valve
14. Pressure relief valve
15. 2-3 shift valve
16. 1-2 shift valve
17. 3-4 shift valve
18. Second brake accumulator
19. Direct clutch accumulator
20. Forward clutch accumulator
21. Solenoid No. 1-A (Shift solenoid A)
22. Solenoid No. 1-B (Shift solenoid B)
23. To oil cooler

2. "D" Range Second Gear

The discharge pressure from the oil pump is regulated to the line pressure by the primary regulator valve and applied to the manual valve, throttle valve, each accumulator and lock-up control valve.

The line pressure fed to the manual valve works on the accumulator to engage the forward clutch. On the other hand, the line pressure passes through the primary regulator valve and 3-4 shift valve to engage the O/D clutch.

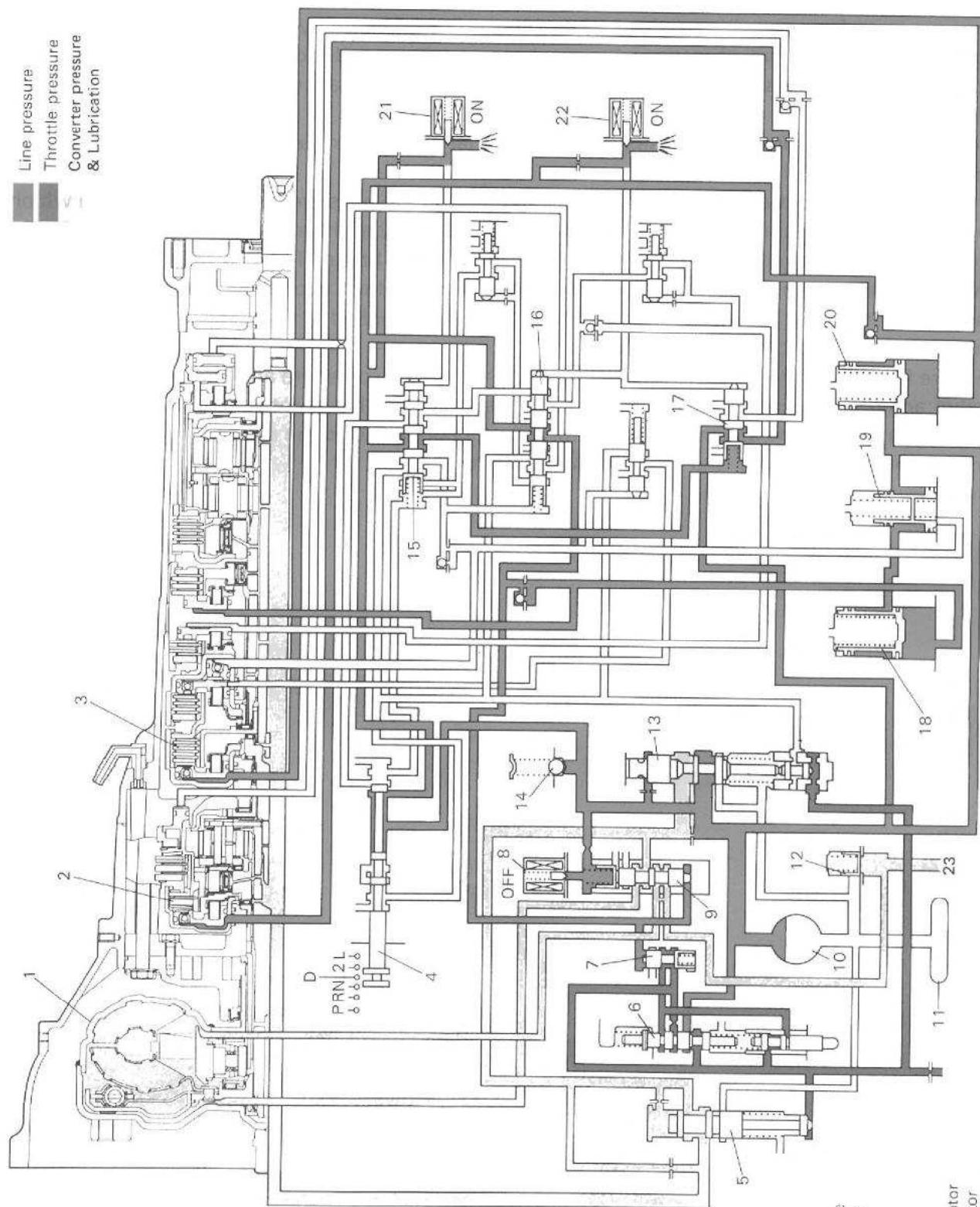
Also, the line pressure fed to the 1-2 shift valve is applied to the accumulator through the passage to the second brake which is opened when the shift solenoid B turns ON and the 1-2 shift valve moves to the left, to cause the second brake to be engaged.

The line pressure fed to the throttle valve is converted into the throttle pressure, applied to the primary regulator valve again and adjusted to the line pressure suitable to that throttle opening.

The throttle pressure fed to the secondary regulator valve is converted to the secondary regulator pressure, fed to the torque converter and used for lubrication.

60A50-7B1-30-1S

Line pressure
Throttle pressure
Converter pressure & Lubrication



1. Torque converter
2. O/D clutch
3. Forward clutch
4. Manual valve
5. Secondary regulator valve
6. Throttle valve
7. Cut back valve
8. Solenoid No.2
(Lock-up solenoid)
9. Lock-up control valve
10. Oil pump
11. Strainer
12. Oil cooler by-pass valve
13. Primary regulator valve
14. Pressure relief valve
15. 2-3 shift valve
16. 1-2 shift valve
17. 3-4 shift valve
18. Second brake accumulator
19. Direct clutch accumulator
20. Forward clutch accumulator
21. Solenoid No.1-A (Shift solenoid A)
22. Solenoid No.1-B (Shift solenoid B)
23. To oil cooler

3. "D" Range Third Gear

The discharge pressure from the oil pump is regulated to the line pressure by the primary regulator valve and applied to the manual valve, throttle valve, each accumulator and lock-up control valve.

The line pressure fed to the manual valve works on the forward clutch accumulator to engage the forward clutch.

On the other hand, the line pressure passes from the primary regulator valve, through the 3-4 shift valve to engage the O/D clutch.

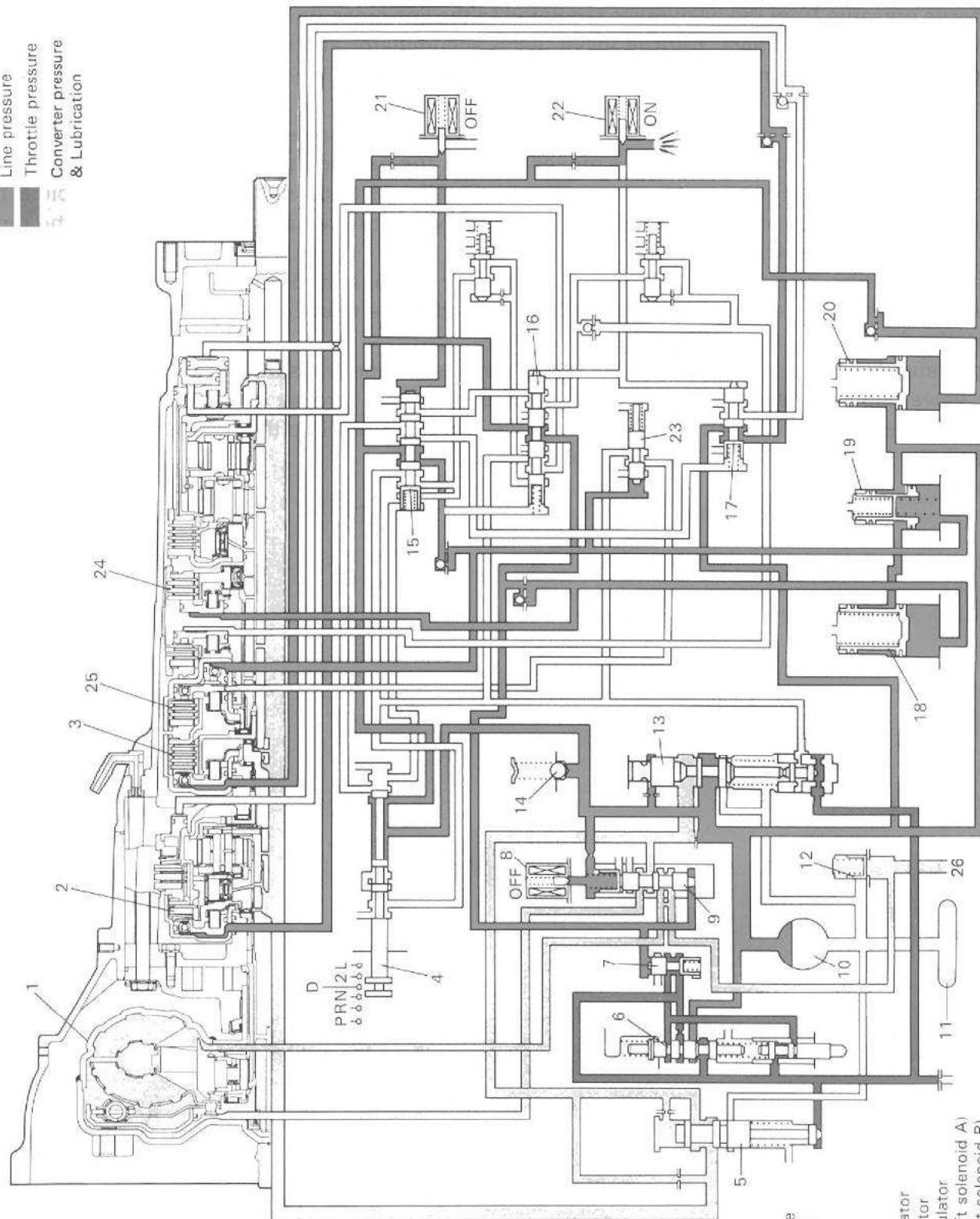
Also, the line pressure fed to the 1-2 shift valve passes through the passage to the second brake which is opened when the shift solenoid B is turned ON to cause the 1-2 shift valve to move to the left and is applied to the second brake accumulator to engage the second brake. The line pressure fed to the 2-3 shift valve passes through the passage to the direct clutch which is opened when the shift solenoid A is turned OFF to cause the valve to move to the left and is applied to the direct clutch accumulator to engage the direct clutch.

The line pressure fed to the throttle valve is converted into the throttle pressure and applied to the primary regulator valve again and adjusted to the line pressure suitable to that throttle opening.

The throttle pressure fed to the secondary regulator valve is converted to the secondary regulator pressure, fed to the torque converter and used for lubrication.

60A50-7B1-32-1S

Line pressure
 Throttle pressure
 Converter pressure
 & Lubrication



1. Torque converter
2. O/D clutch
3. Forward clutch
4. Manual valve
5. Secondary regulator valve
6. Throttle valve
7. Cut back valve
8. Solenoid No. 2
(Lock-up solenoid)
9. Lock-up control valve
10. Oil pump
11. Strainer
12. Oil cooler bypass valve
13. Primary regulator valve
14. Pressure relief valve
15. 2-3 shift valve
16. 1-2 shift valve
17. 3-4 shift valve
18. Second brake accumulator
19. Direct clutch accumulator
20. Forward clutch accumulator
21. Solenoid No. 1-A (Shift solenoid A)
22. Solenoid No. 1-B (Shift solenoid B)
23. Reverse clutch sequence valve
24. Second brake
25. Direct clutch
26. To oil cooler

4. "D" Range Fourth Gear (Over Drive)

The discharge pressure from the oil pump is regulated to the line pressure by the primary regulator valve and applied to the manual valve, throttle valve, each accumulator and lock-up control valve.

The line pressure fed to the manual valve works on the forward clutch accumulator to engage the forward clutch.

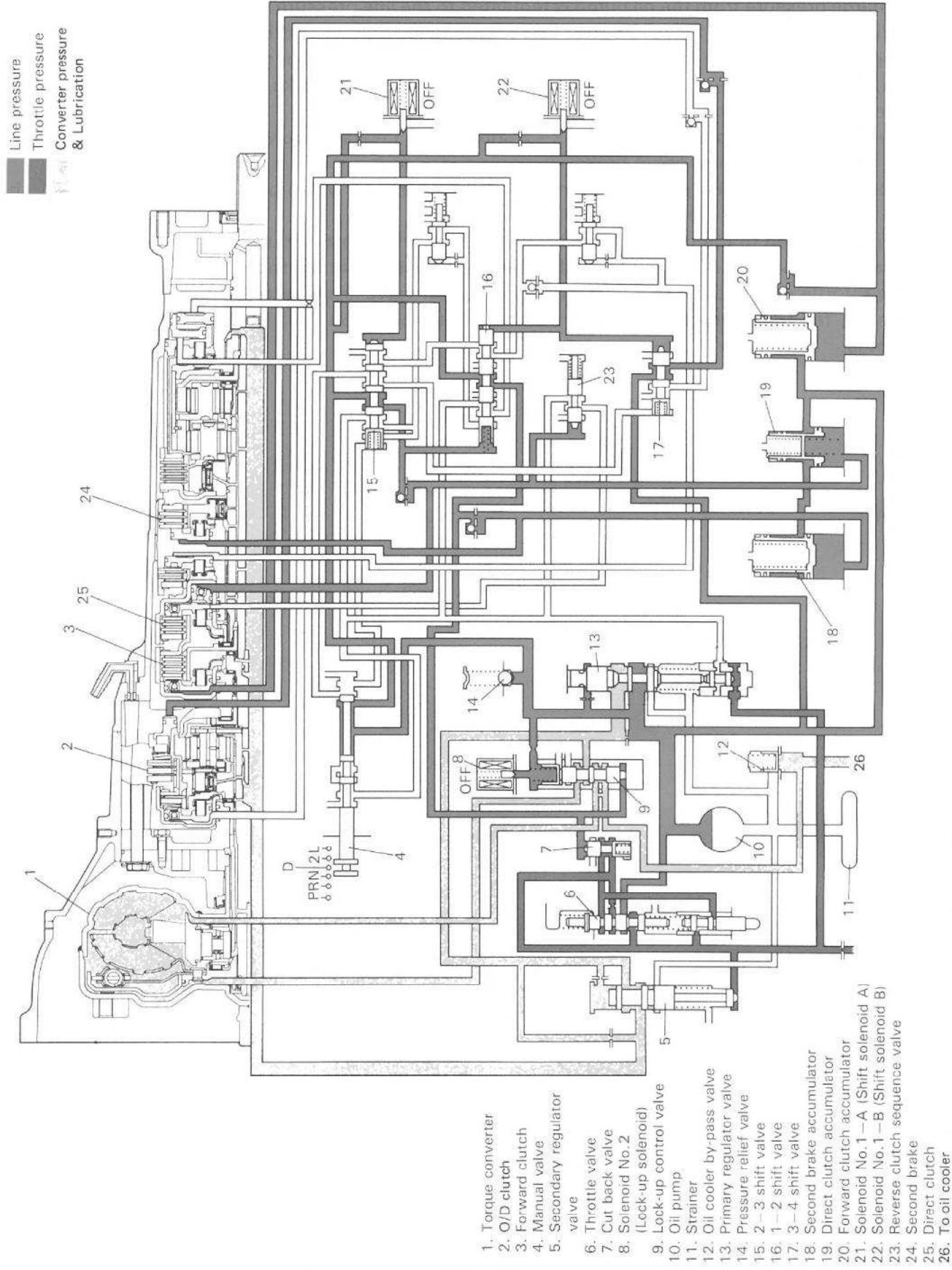
On the other hand, the line pressure fed from the primary regulator valve to the 3–4 shift valve turns OFF the sihft solenoid B, thereby the valve moves to open the passage to the O/D brake and thus the O/D brake is engaged. The line pressure fed to the 1–2 shift valve turns OFF the sihft solenoid B but as the line pressure is also applied through the 2–3 shift valve to the valve from the left to the right, it does not move to the left.

Thus, the line pressure is applied to the second brake accumulator and the second brake gets engaged. Also, the line pressure fed to the 2–3 shift valve is applied to the direct clutch accumulator to engage the direct clutch.

The line pressure fed to the throttle valve is converted in the throttle pressure and applied to the primary regulator valve and adjusted to the line pressure suitable to that throttle oepning.

The throttle pressure fed to the secondary regulator valve is converted into the secondary regulator pressure, fed to the torque converter and used for lubrication.

60A50-7B1-34-1\$



5. "2" Range Second Gear

The discharge pressure from the oil pump is regulated to the line pressure by the primary regulator valve and applied to the manual valve, throttle valve, each accumulator and lock-up control valve.

The line pressure fed to the manual valve works on the F/C accumulator to engage the forward clutch. Similarly, the line pressure passes through the 1—2 shift valve and works on the second brake accumulator to engage the second brake.

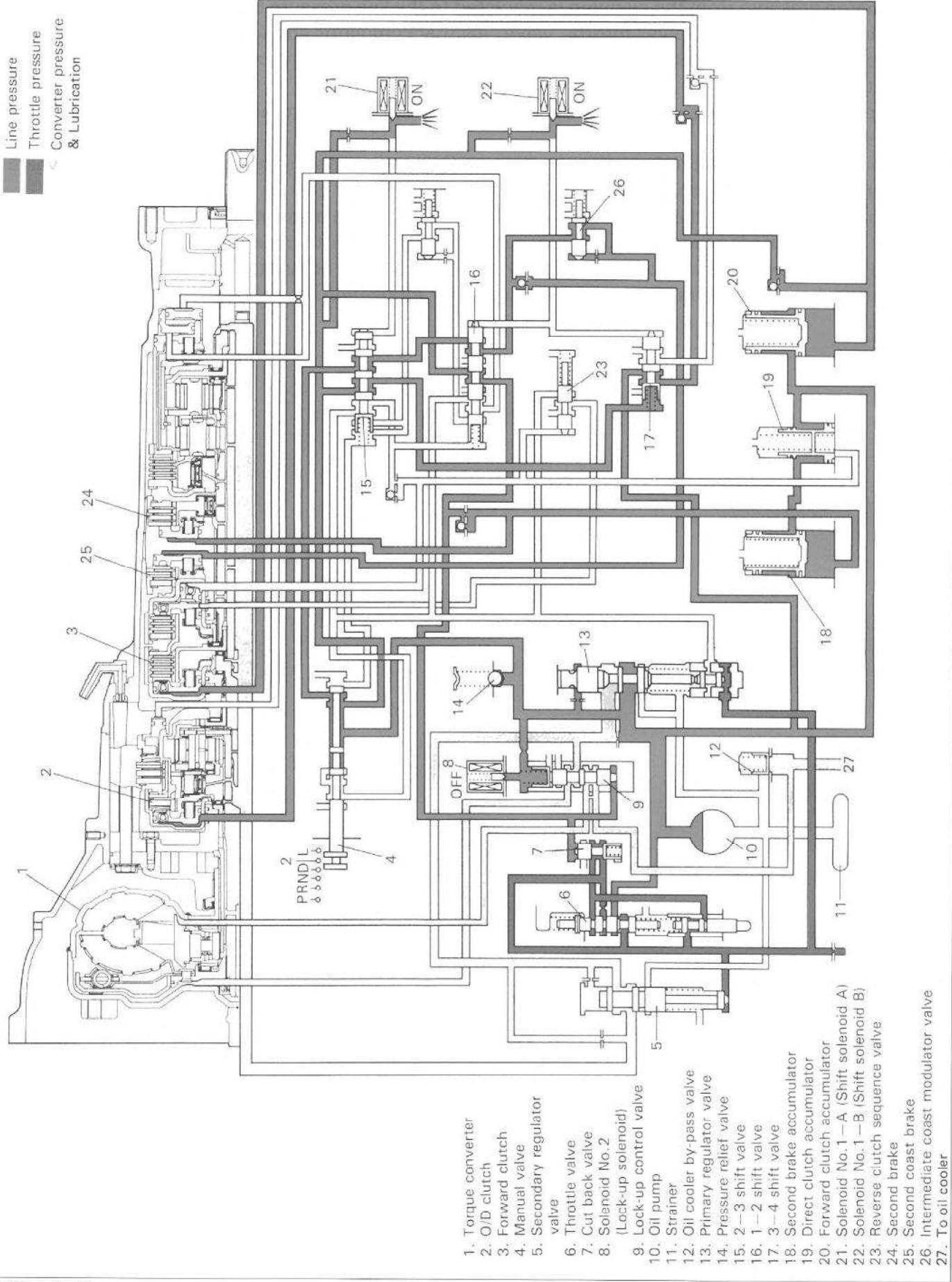
Also, the line pressure passes through the 2—3 shift valve, 1—2 shift valve and intermediate modulator valve to engage the second coast brake.

On the other hand, the line pressure from the primary regulator valve passes through the 3—4 shift valve to engage the O/D clutch.

The line pressure fed to the throttle valve is converted to the throttle pressure and applied again to the primary regulator valve and adjusted to the line pressure suitable for the throttle opening.

Also, the throttle pressure fed to the secondary regulator valve is converted into the secondary regulator pressure, fed to the torque converter and used for lubrication.

60A50-7B1-36-1S



6. "L" Range

The discharge pressure from the oil pump is regulated to the line pressure by the primary regulator valve and applied to the manual valve, throttle valve, each accumulator and lock-up control valve.

The line pressure fed to the manual valve works on the forward clutch accumulator to engage the forward clutch.

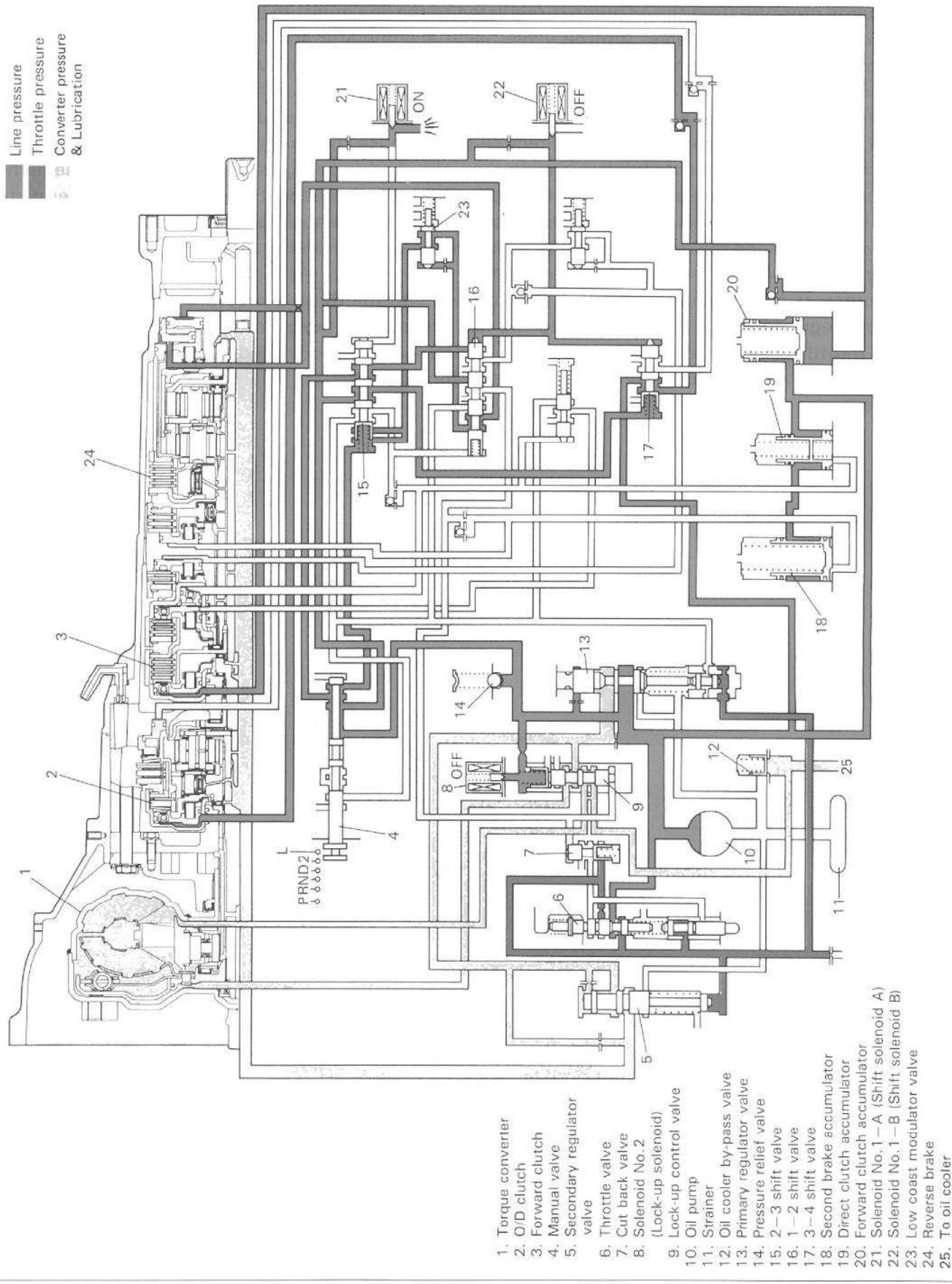
The same line pressure passes through the 2—3 shift valve, low coast modulator valve and 1—2 shift valve to engage the brake.

Furthermore, the line pressure from the primary regulator valve passes through the 3—4 shift valve to engage the over drive clutch.

The line pressure fed to the throttle valve is converted to the throttle pressure, applied again to the primary regulator valve and adjusted to the line pressure suitable for the throttle opening.

Also, the throttle pressure fed to the secondary regulator valve is converted into the secondary regulator pressure, fed to the torque converter and used for lubrication.

60A50-7B1-38-1S



7. "R" Range

The discharge pressure from the oil pump is regulated to the line pressure by the primary regulator valve and applied to the manual valve, throttle valve, each accumulator and lock-up control valve.

The line pressure fed to the manual valve passes through the 2—3 shift valve and works on the direct clutch accumulator and then to the inner piston side of the direct clutch.

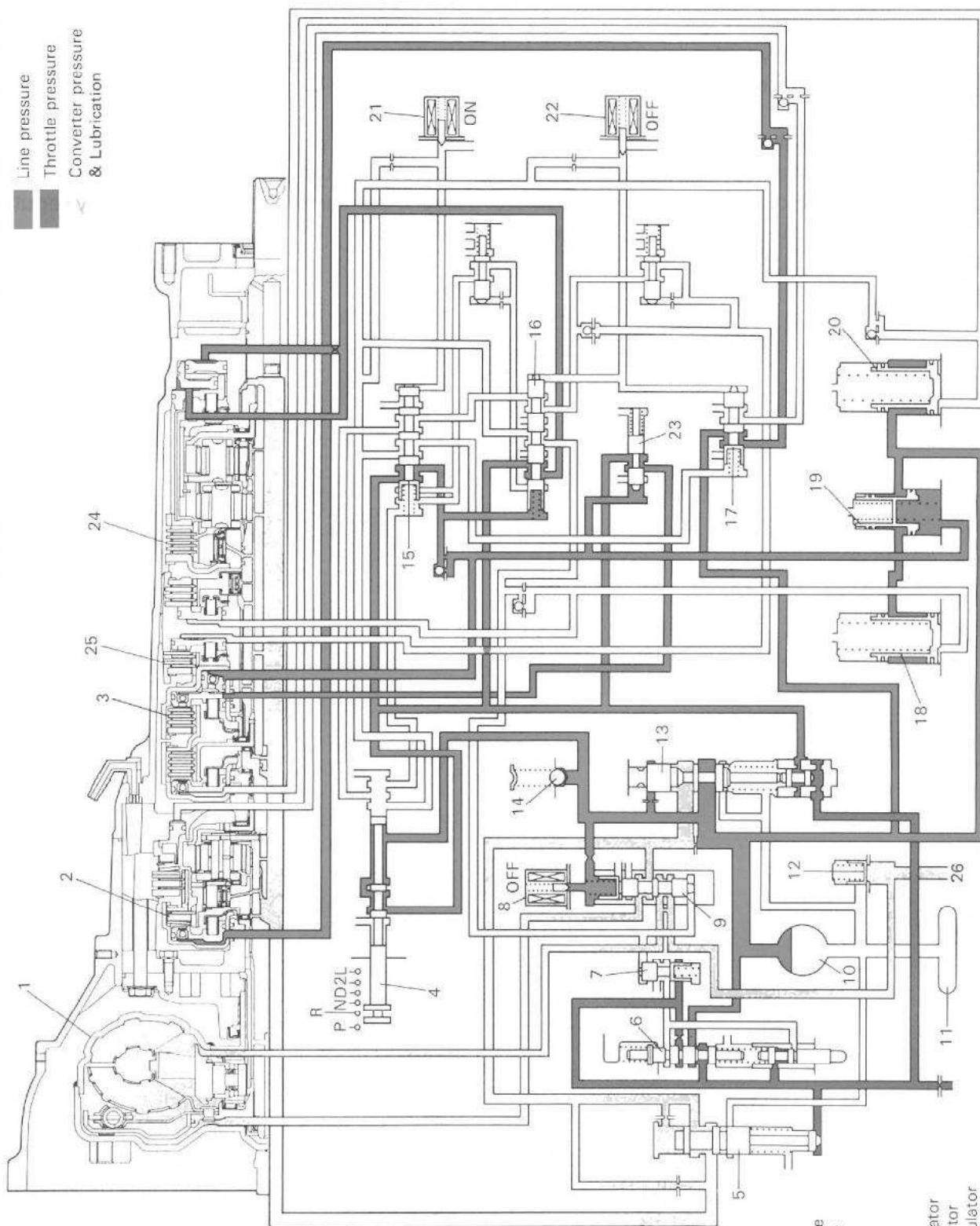
On the other hand, the line pressure fed from the manual valve to the reverse clutch sequence valve is applied to the outer piston side of the direct clutch because the line pressure through the passage to the inner piston of the direct clutch moves to the right. At this point, as the reverse clutch sequence valve does not move till the inner piston of the direct clutch completes its operation, the outer piston operates later to relieve the shock. The line pressure from the manual valve passes through the 1—2 shift valve and engages the reverse brake. Also, the line pressure from the primary regulator valve passes through the 3—4 shift valve to engage the over drive clutch.

The line pressure fed to the throttle valve is converted into the throttle pressure and applied again to the primary regulator valve and adjusted to the line pressure suitable for the throttle opening.

Also, the throttle pressure fed to the secondary regulator valve is converted into the secondary regulator pressure, fed to the torque converter and used for lubrication.

60A50-7B1-40-1S

 Line pressure
 Throttle pressure
 Converter pressure & Lubrication



1. Torque converter
2. O/D clutch
3. Direct clutch
4. Manual valve
5. Secondary regulator valve
6. Throttle valve
7. Cut back valve
8. Solenoid No. 2 (Lock-up solenoid)
9. Lock-up control valve
10. Oil pump
11. Strainer
12. Oil cooler by-pass valve
13. Primary regulator valve
14. Pressure relief valve
15. 2-3 shift valve
16. 1-2 shift valve
17. 3-4 shift valve
18. Second brake accumulator
19. Direct clutch accumulator
20. Forward clutch accumulator
21. Solenoid No. 1 - A (Shift solenoid A)
22. Solenoid No. 1 - B (Shift solenoid B)
23. Reverse brake sequence valve
24. Reverse brake
25. Second coast brake
26. To oil cooler

8. "N" or "P" Range

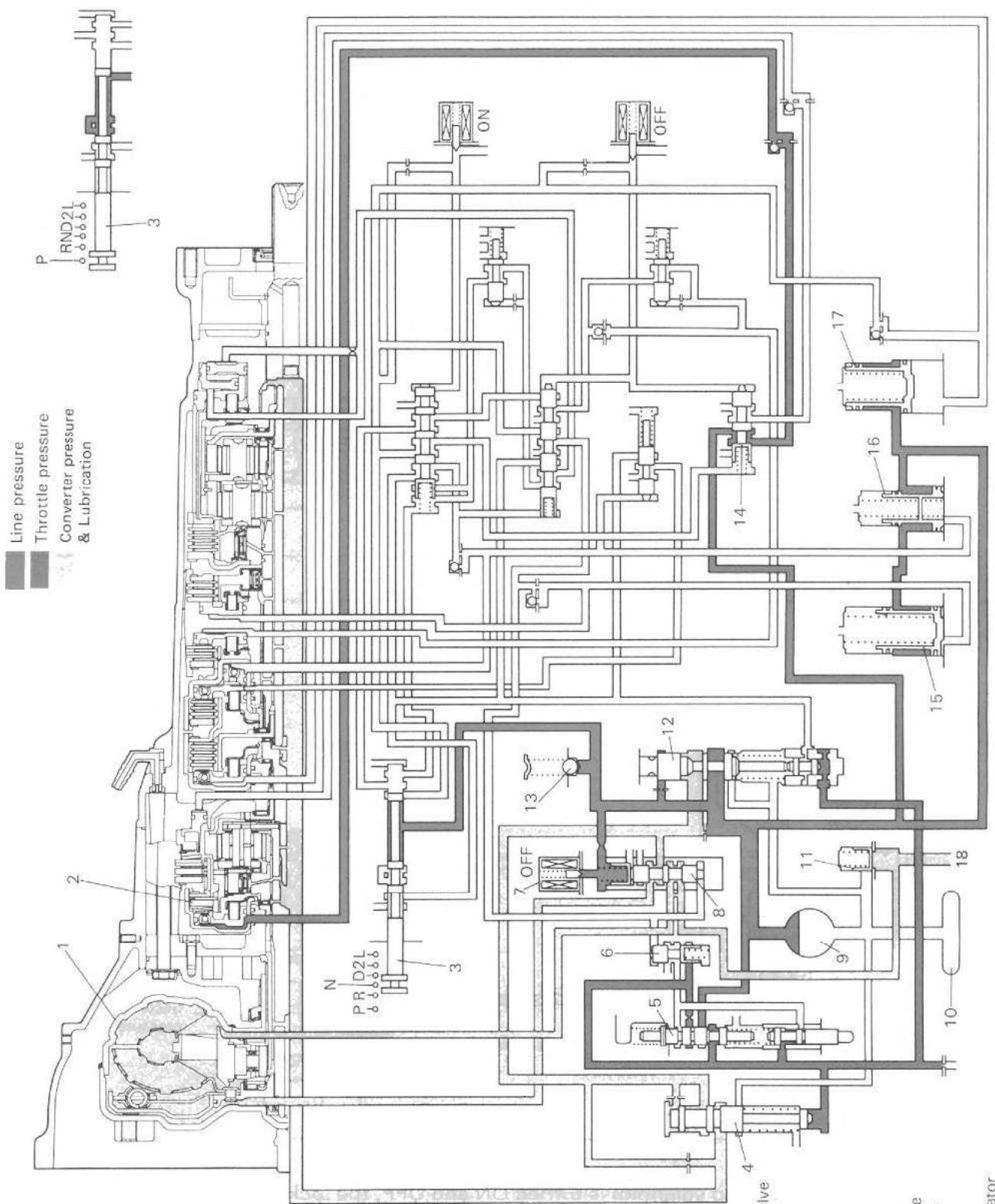
The discharge pressure from the oil pump is regulated to the line pressure by the primary regulator valve and applied to the manual valve, throttle valve, each accumulator and lock-up control valve.

The line pressure from the primary regulator valve passes through the 3—4 shift valve to engage the O/D clutch.

The line pressure fed to the throttle valve is converted into the throttle pressure, applied again to the primary regulator valve and adjusted to the line pressure suitable for the throttle pressure then.

Also, the throttle pressure fed to the secondary regulator valve is converted into the secondary regulator pressure, fed to the torque converter and used for lubrication.

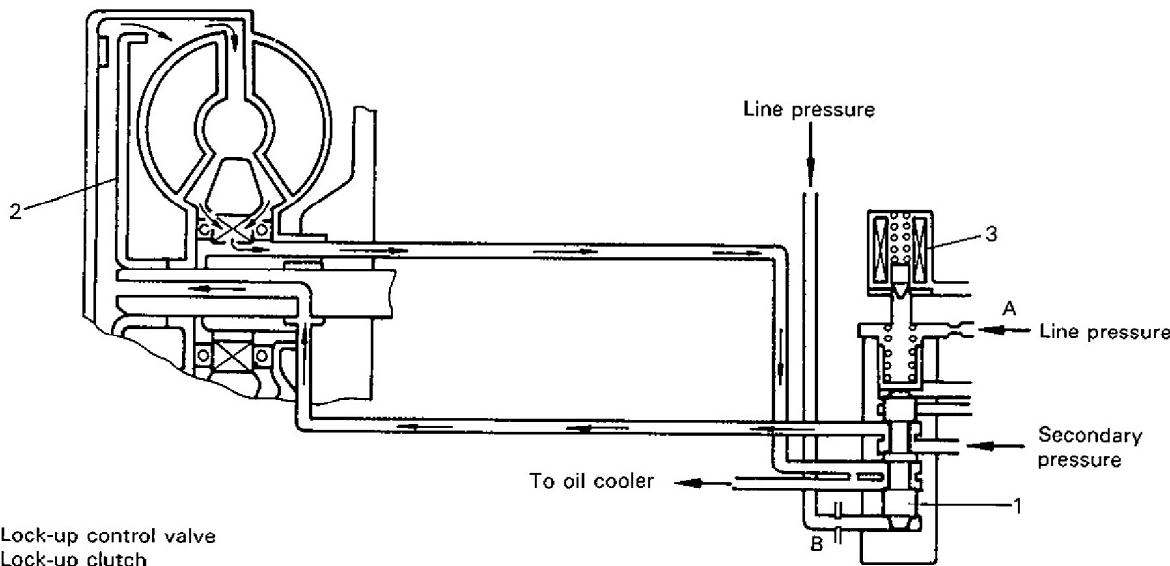
60A50-7B1-42-1S



1. Torque converter
2. O/D clutch
3. Manual valve
4. Secondary regulator valve
5. Throttle valve
6. Cut back valve
7. Solenoid No.2
8. Lock-up solenoid
9. Lock-up control valve
10. Oil pump
11. Strainer
12. Oil cooler by-pass valve
13. Primary regulator valve
14. Pressure relief valve
15. 3-4 shift valve
16. Second brake accumulator
17. Direct clutch accumulator
18. Forward clutch accumulator
19. To oil cooler

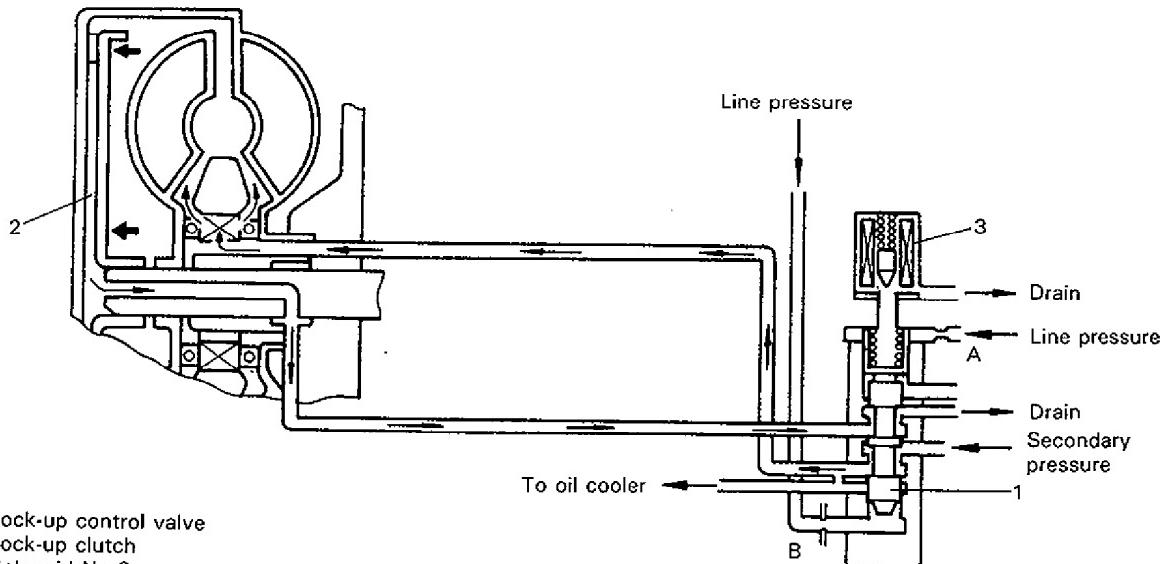
LOCK-UP MECHANISM

Lock-up OFF



60A50-7B1-44-1S

Lock-up ON



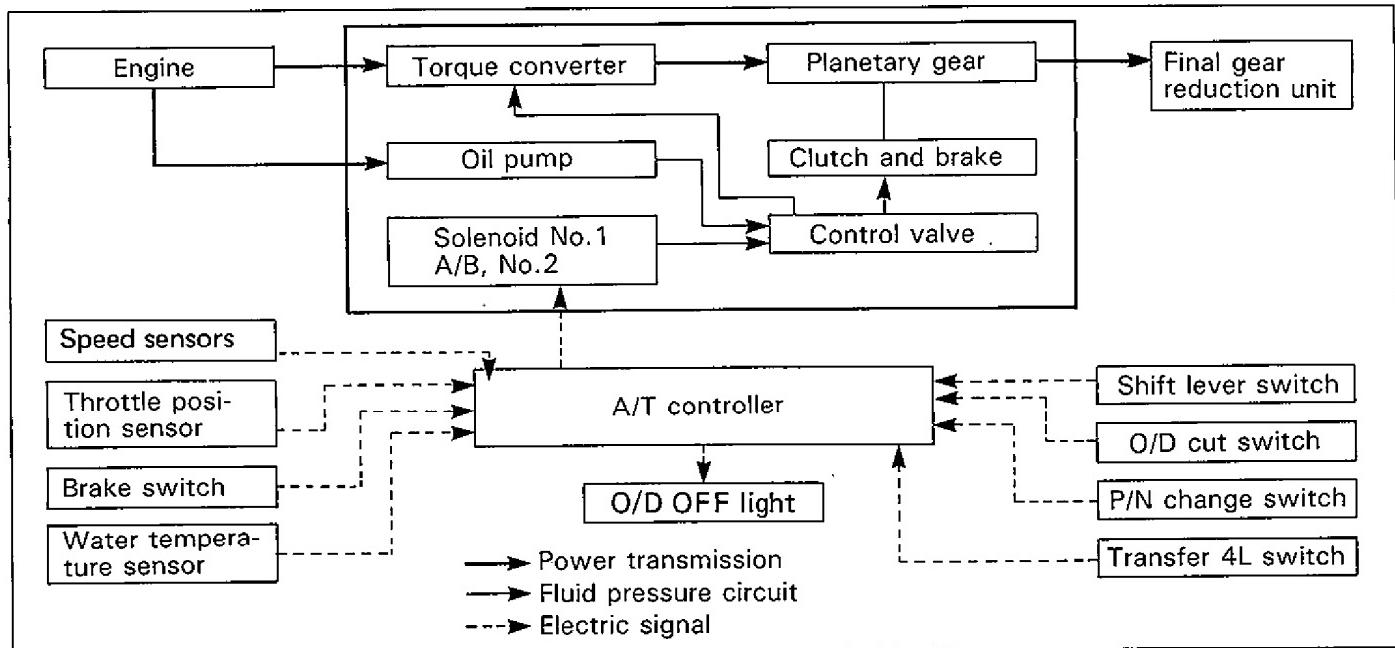
60A50-7B1-44-2S

When the solenoid No.2 (Lock-up solenoid) is turned ON and OFF, the lock-up ON/OFF operation is controlled automatically. When the lock-up clutch is OFF, the lock-up solenoid is turned OFF and the line pressure from the A passage and the spring tension is stronger than the line pressure from the B passage, thereby the valve is pushed down and the lock-up clutch is turned OFF.

When the lock-up solenoid is turned ON, the line pressure in the A passage is drained and the line pressure from the B passage becomes stronger than the spring tension so that the valve is pushed up to turn the lock-up ON.

60A50-7B1-44-3S

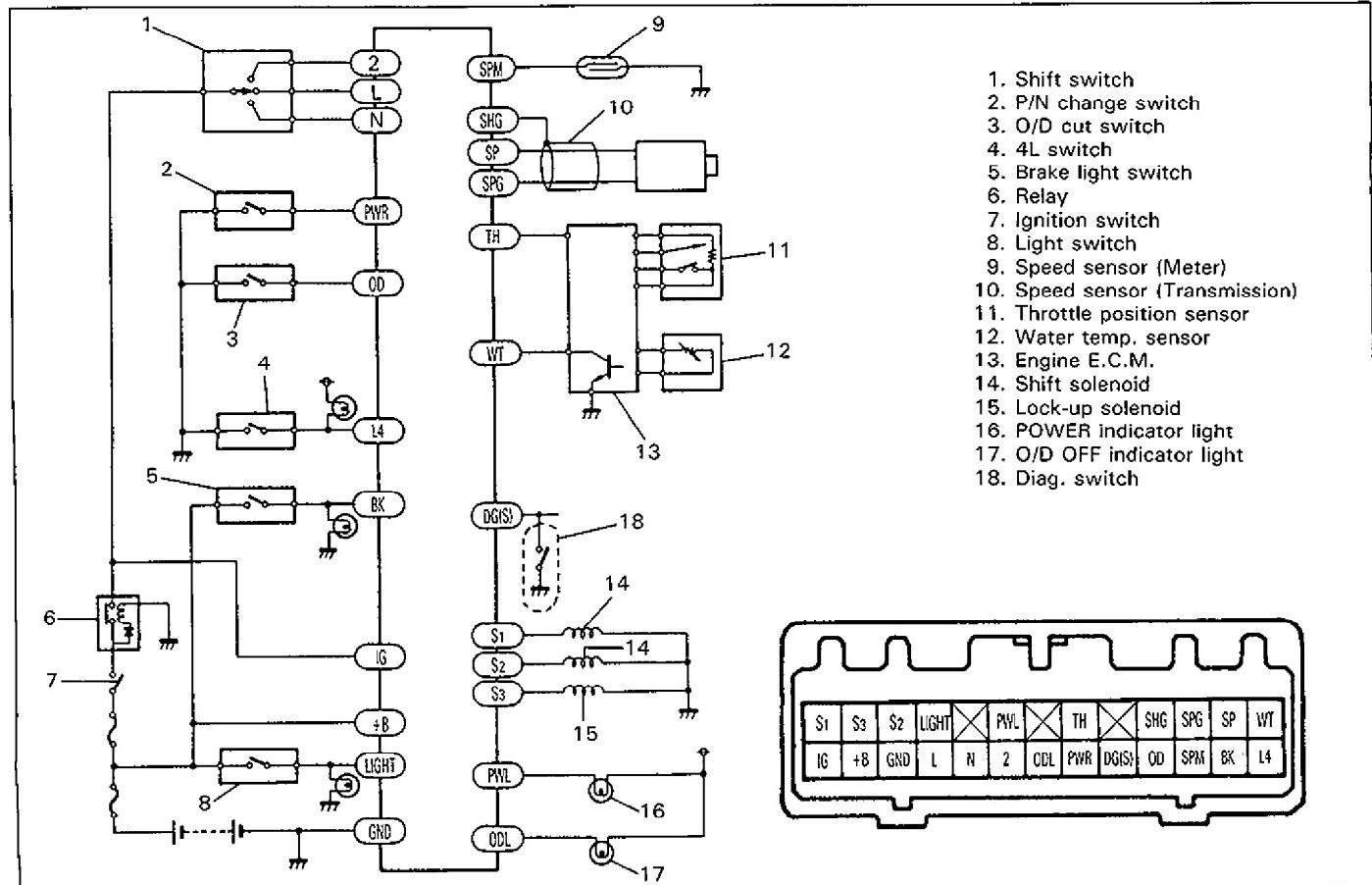
ELECTRONIC SHIFT CONTROL SYSTEM



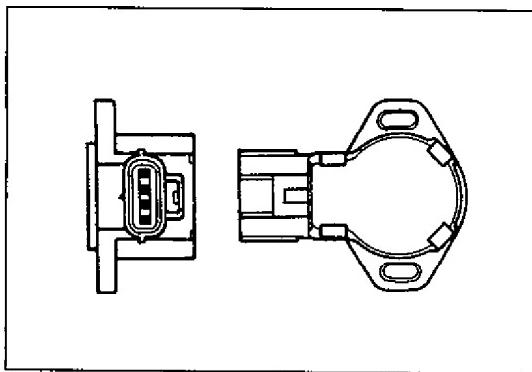
60A50-7B1-45-1S

A/T CONTROLLER (COMPUTER)

The A/T controller is an electronic circuit component that controls gear shift and idle-up according to the signal from each sensor. It is a microcomputer consisting of an IC, transistor, diode, etc. It is installed at the right side of the steering column on LH steering vehicle and at the left side of the steering column on RH steering vehicle.



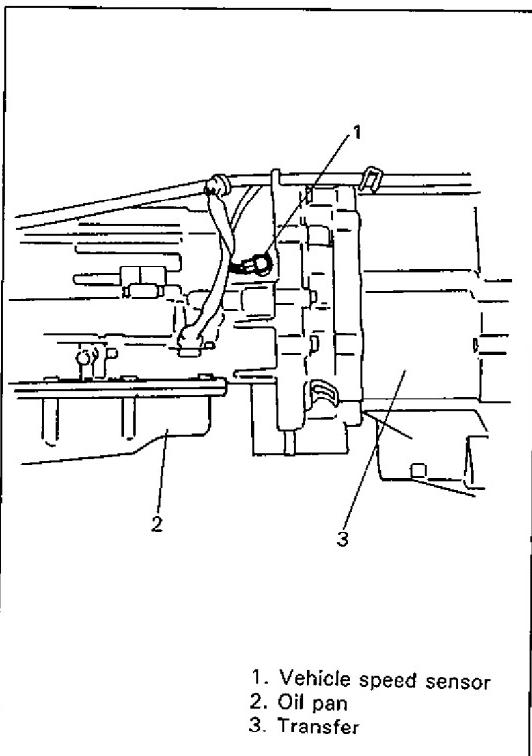
60A50-7B1-45-2S



60A50-7B1-46-1S

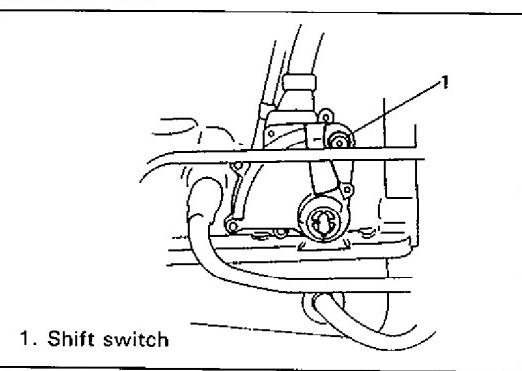
Throttle Position Sensor

This sensor is installed to the throttle valve shaft. Throttle valve opening signal are transmitted from TPS to ECM as voltage signal. The signal is converted to duty signal in ECM and it is sent to A/T controller.



60A50-7B1-46-2S

1. Vehicle speed sensor
2. Oil pan
3. Transfer

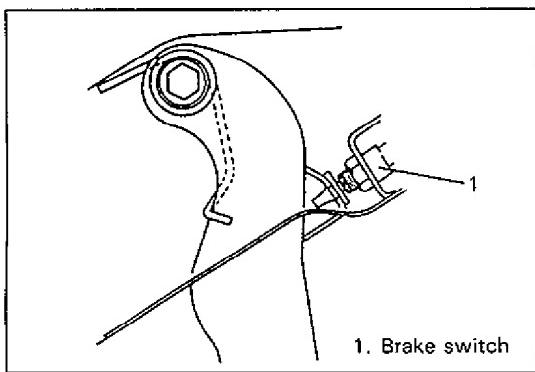


60A50-7B1-46-4S

Shift Switch

A shift switch is provided so that the engine can be started only when the shift lever is in the "P" or "N" position.

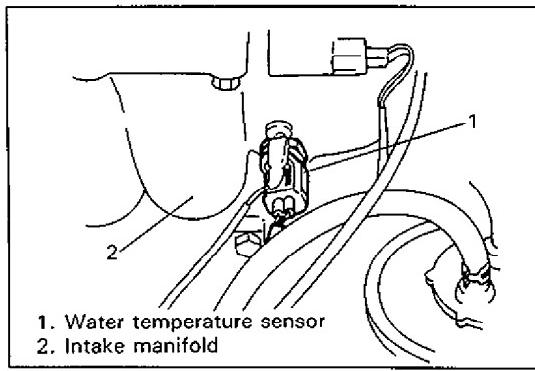
Terminal position	6	5	9	8	4	7	3	2	1
	Black/Yellow	Black/Red	Yellow	Blue/Red	Red	Blue/Green	Yellow/Red	Yellow/Green	Yellow/Blue
P	○	○	○	○					
R			○		○				
N	○	○	○		○				
D			○			○			
2			○				○		
L			○						○



60A50-7B1-47-1S

Brake Switch

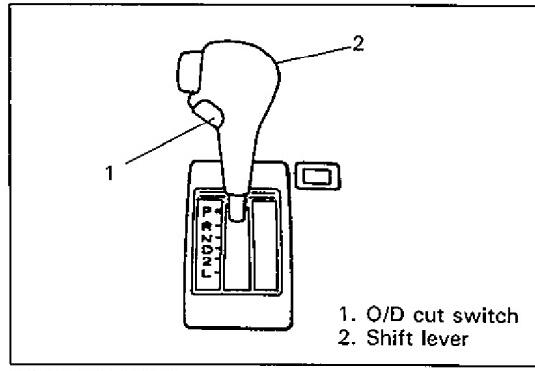
The same switch is used as the brake lamp switch. It disengages the lock-up clutch when the brake is depressed while the lock-up clutch is operating.



60A50-7B1-47-2S

Water Temperature Sensor

The water temperature sensor of the electronic fuel injection system is used and it prevents gear change to the O/D gear when the engine coolant temperature is 60°C (140°F) or lower.

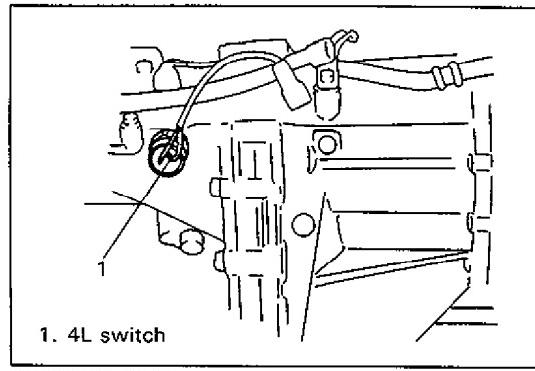


60A50-7B1-47-3S

O/D Cut Switch

The gear shift up or shift down to and from the O/D gear can be selected with this switch.

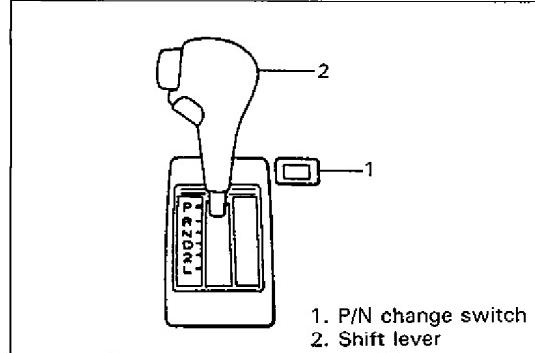
O/D cut switch	O/D OFF indicator light
OFF	ON
ON	OFF



60A50-7B1-47-4S

Transfer 4L Switch

This switch detects that the 4-wheel drive low gear is engaged and prevents the gear change into O/D and lock-up.



60A50-7B1-47-5S

P/N Change Switch

The gear shift timing, normal or power, can be selected by using this switch.

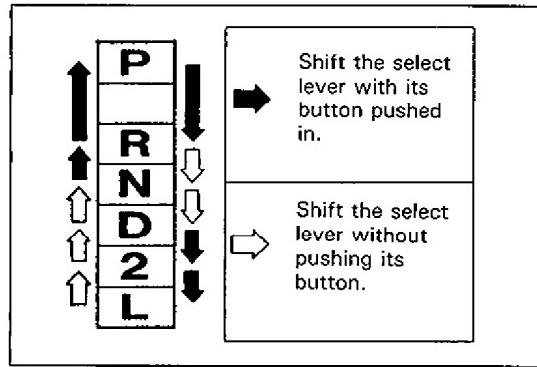
Fail Safe Function

This function is provided by the safe mechanism that assures safe driveability even when the shift solenoid or speed sensor fails.

The table below shows the gear position in each shift under a normal/abnormal condition.

Shift position \ Condition	Normal	Shift solenoid-A abnormal	Shift solenoid-B abnormal	Shift solenoid-A & B abnormal	
D	1st	3rd	1st	O/D	
	2nd		O/D		
	3rd				
	O/D				
2	1st	3rd	1st	3rd	
	2nd		(3rd)		
	(3rd)				
L	1st	1st	(2nd)	1st	
	(2nd)	(2nd)			

60A50-7B1-48-1S



60A50-7B1-48-3S

Change Mechanism

The same select pattern shift lever is used as the floor type and frequently used "N" and "D" ranges are made selectable freely.

AUTOMATIC GEAR SHIFT DIAGRAM

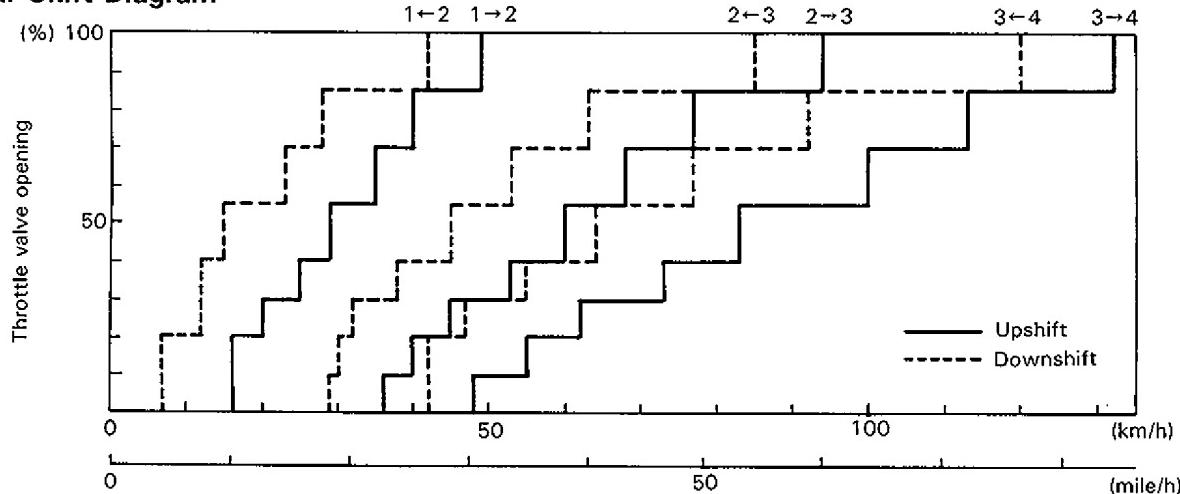
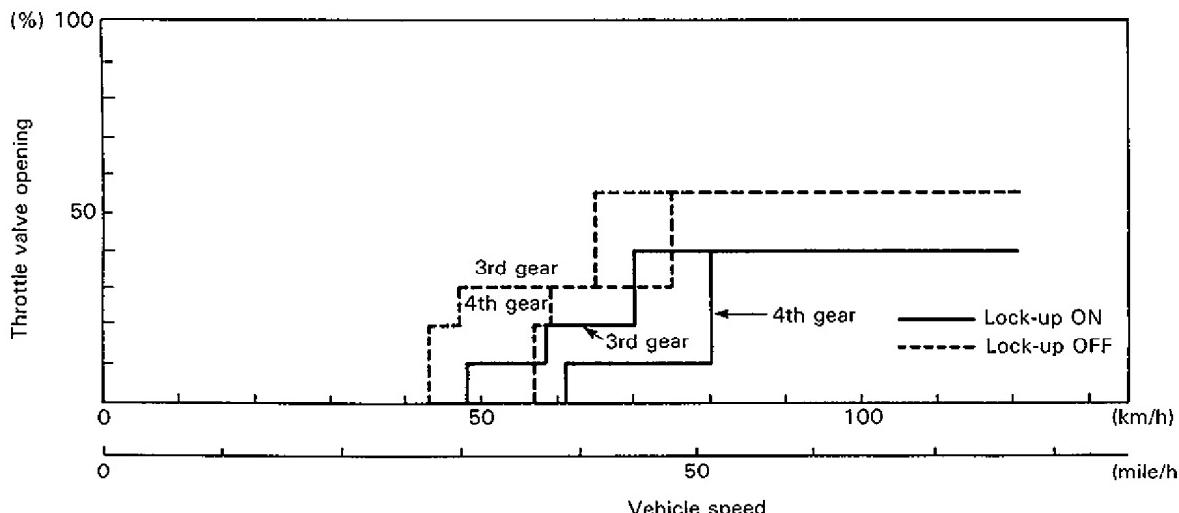
Automatic shift schedule as a result of shift control is shown below. In case that select lever is shifted to L at a higher than 52 km/h (32.5 mile/h) speed, 2nd gear is operated and then down shifts to 1st at a speed lower than that. No up shift is available in L.

The same as, the select lever is shifted to 2 at a higher than 100 km/h (62.5 mile/h) speed, 3rd gear is operated and then down shifts to 2nd at a speed lower than that. No up shift is available in 2.

Power Mode

Unit: km/h
(mile/h)

Shift	1→2	2→3	3→4	4→3	3→2	2→1
Throttle opening						
Full throttle	49 (31)	94 (59)	132 (83)	120 (75)	85 (53)	42 (26)
Closed throttle	16 (10)	36 (23)	48 (30)	42 (26)	29 (18)	7 (4)

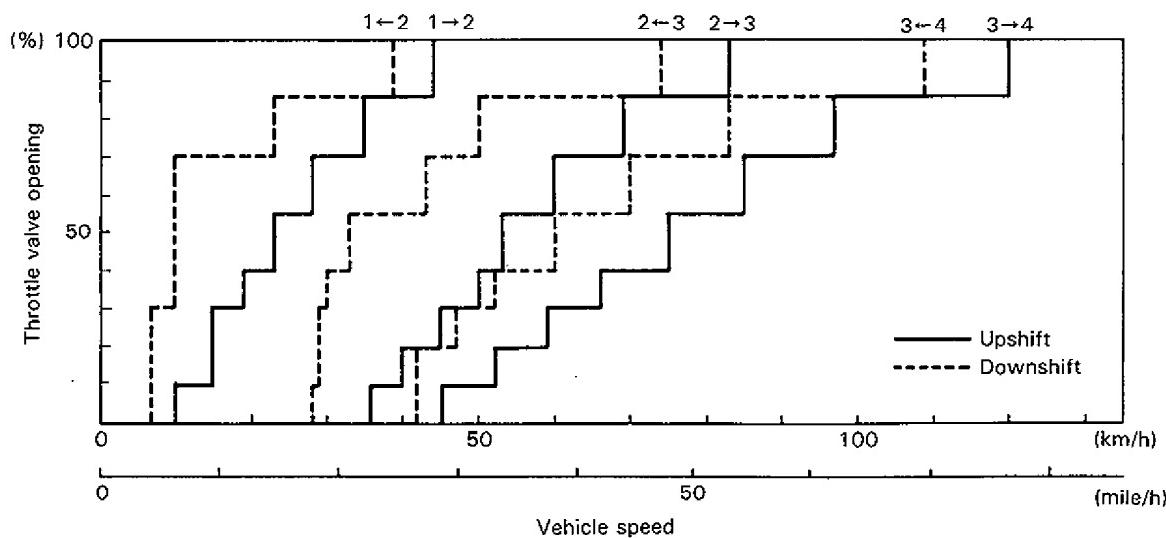
Gear Shift Diagram**Lock-up Diagram**

Normal Mode

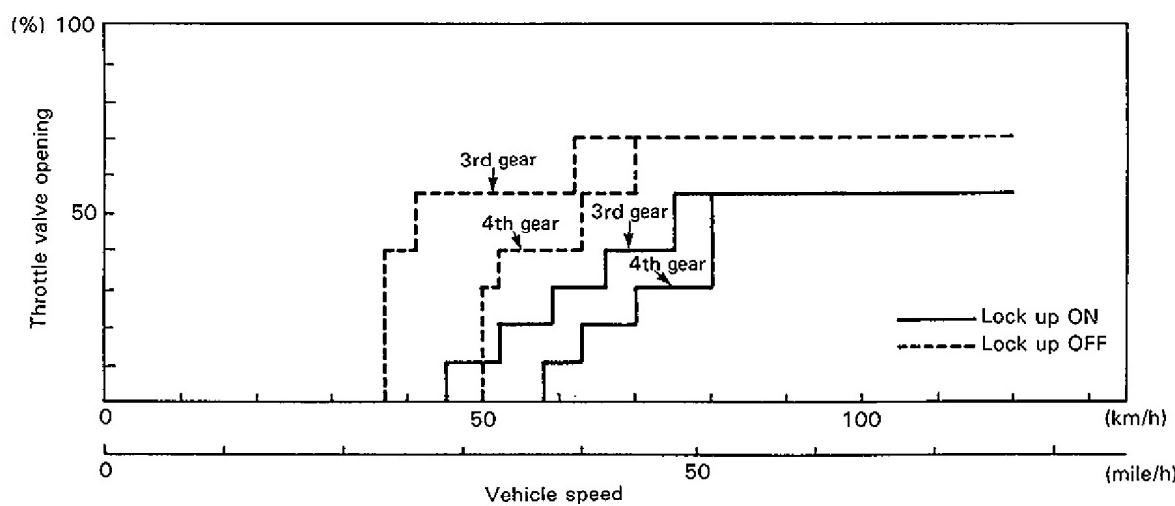
Unit: km/h
(mile/h)

Shift	1→2	2→3	3→4	4→3	3→2	2→1
Throttle opening						
Full throttle	44 (28)	83 (52)	120 (75)	109 (68)	74 (46)	39 (24)
Closed throttle	10 (6)	36 (23)	45 (28)	42 (26)	28 (17)	7 (4)

Gear Shift Diagram



Lock-up Diagram



DIAGNOSIS

When a vehicle is brought in for service, its trouble should be identified with the below group by asking the user about the conditions of the trouble as precisely as possible and performing the recreation test based on them.

Possible troubles of the automatic transmission are grouped into following types.

- (1) Improper inspection or maladjustment
- (2) Poor engine performance
- (3) Fault in fluid pressure control mechanism
- (4) Fault in electronic control unit
- (5) Mechanical fault in transmission

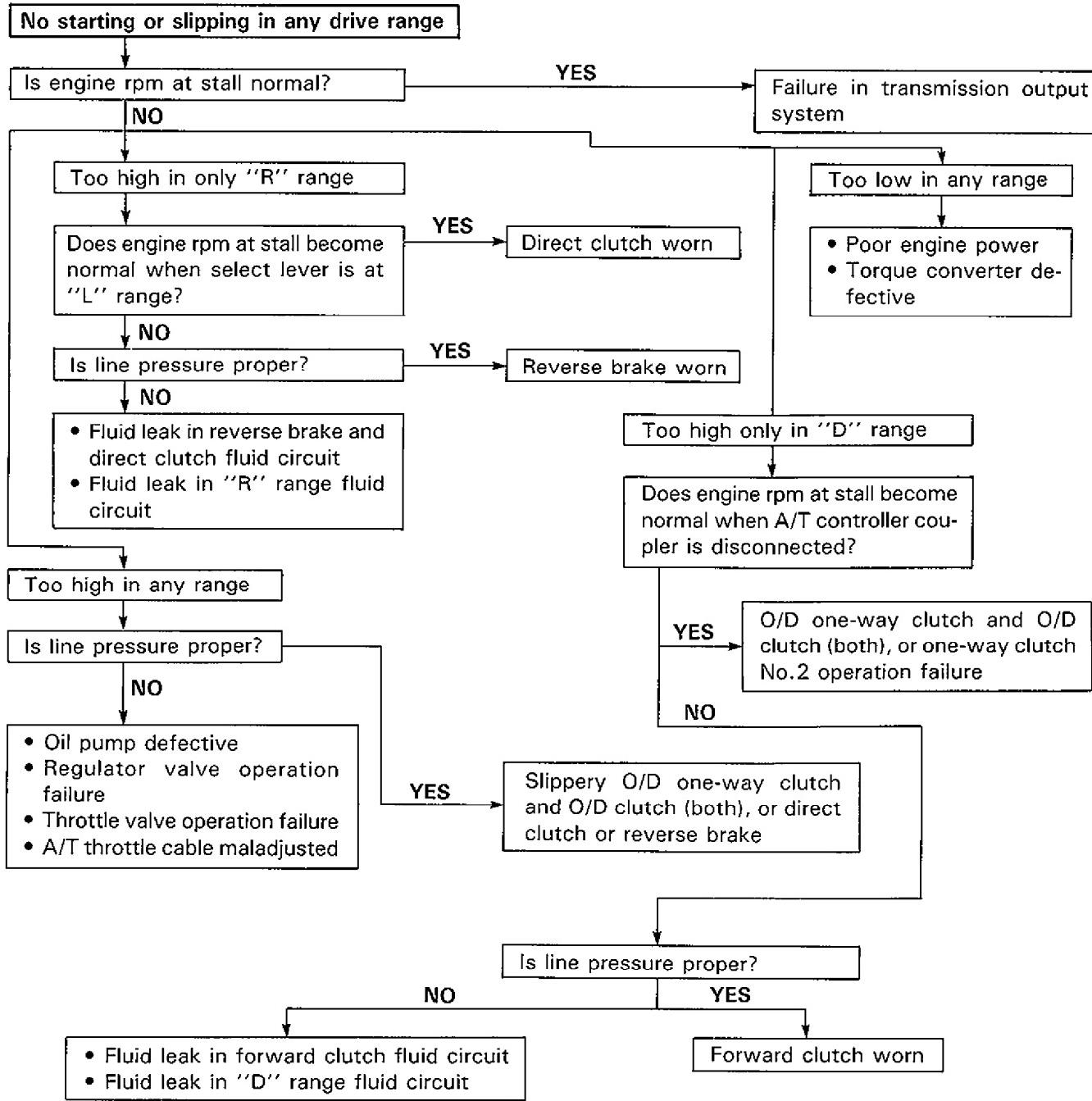
TRANSMISSION UNIT

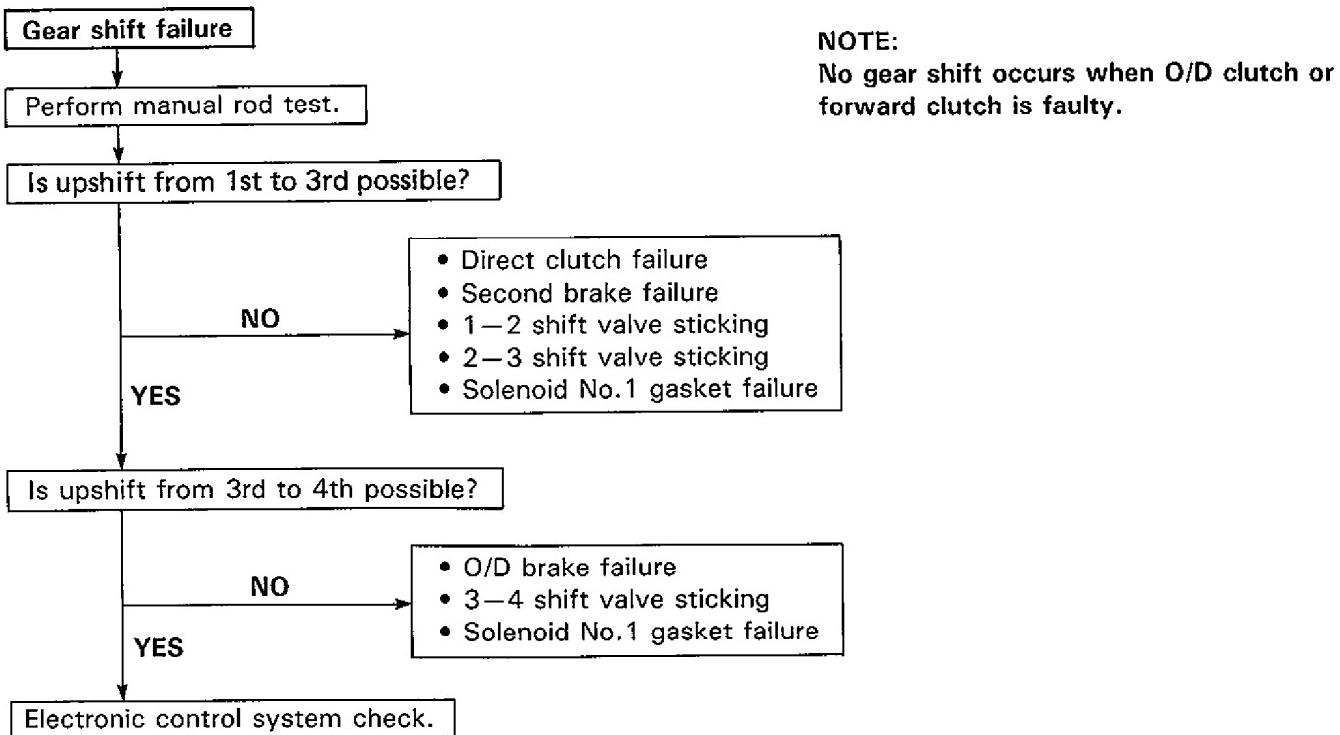
SYSTEMATIC TROUBLESHOOTING

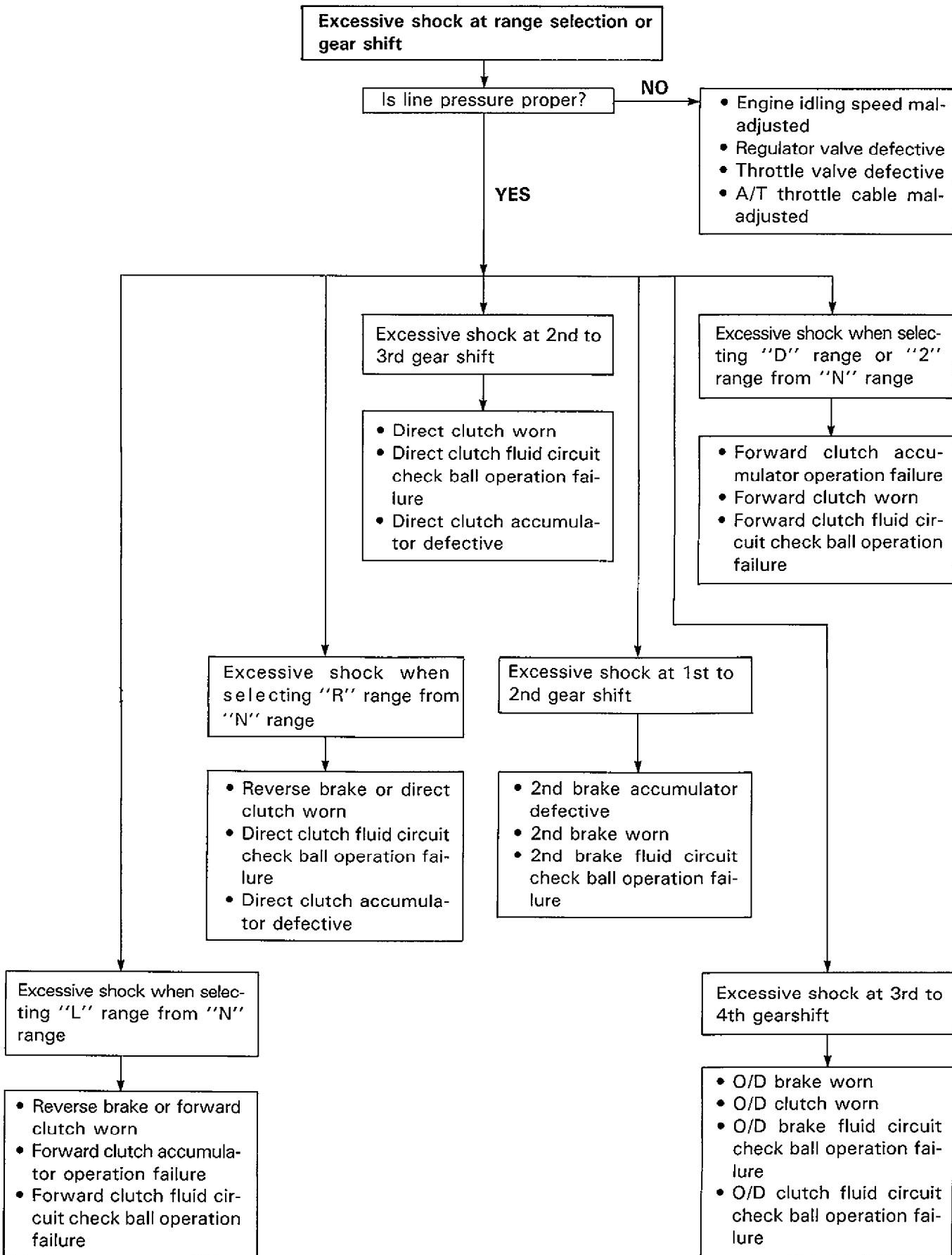
Before performing troubleshooting for mechanical function described hereafter, make sure to check each of the following.

- 1. Engine coolant temperature is at normal operation temperature.
- 2. Engine idle speed is within specification.
- 3. Transmission fluid level is between FULL HOT and LOW HOT marks on dipstick at normal operating temperature of transmission fluid.
- 4. A/T throttle cable and select cable are adjusted properly.
- 5. Electronic circuit of gear shift control system is free from break, coupler disconnection and poor contact.

60A50-7B1-51-1S





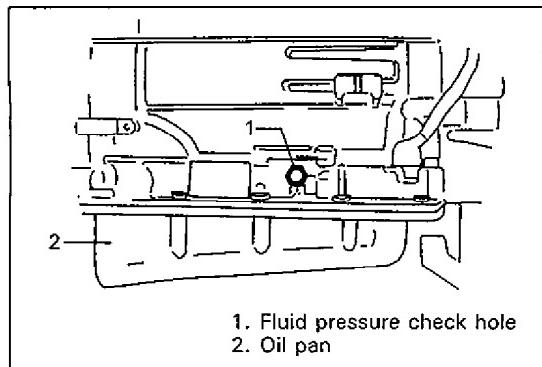


TROUBLE DIAGNOSIS TABLE

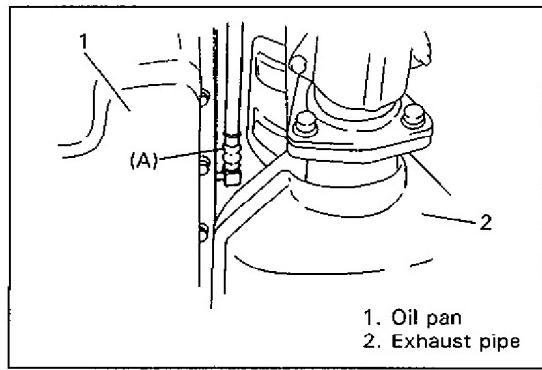
Condition	Possible Cause	Correction
Transmission fluid	Low fluid level	<ul style="list-style-type: none"> Fluid leakage from oil filler tube External fluid leakage Fill fluid to specified level. Repair.
	Fluid leakage from transmission case joint	<ul style="list-style-type: none"> Excessively high fluid level Crushed breather hose Adjust to specified fluid level. Repair.
	Fluid leakage from transmission case	<ul style="list-style-type: none"> Manual select shaft Oil pan gasket O-ring of oil filler tube Oil pressure gauge plug O-ring of electric connector Replace. Replace gasket. Replace O-ring. Retighten plug. Replace.
	Low fluid pressure	<ul style="list-style-type: none"> Low A/T fluid level. Clogged oil pump strainer Leakage from oil pressure circuit Malfunction of pressure regulator valve Fill fluid to specified level. Wash strainer. Overhaul. Overhaul valve body.
	High fluid pressure	Overhaul valve body.
Running condition	Unable to run in all ranges	<ul style="list-style-type: none"> Low A/T fluid level Wear in oil pump Seizure in oil pump Regulator valve stick Clogged oil strainer Seized or broken planetary gear Fluid pressure leakage to over drive clutch due to wear of oil pump bushing Faulty in torque converter Faulty manual valve Refill fluid to specified level. Replace. Replace. Replace. Wash strainer. Repair or replace. Replace. Replace. Replace.

Condition		Possible Cause	Correction
Running condition	Poor 1st speed running or excessive slippage in "D" or "2"	<ul style="list-style-type: none"> Fluid pressure leakage from forward clutch due to wear or breakage of O/D case seal ring Overdrive clutch slipping Faulty 1—2 shift valve 	Replace. Replace. Replace.
	Unable to run or excessive slippage in "L" range	<ul style="list-style-type: none"> Fluid pressure leakage of forward clutch due to wear or breakage of O/D case seal ring Reverse brake disc slipping Broken brake piston O-ring 	Replace. Replace. Replace.
	Unable to run or excessive slippage in "R" range	<ul style="list-style-type: none"> Fluid pressure leakage to direct clutch due to wear or breakage of center support seal ring Worn direct clutch 	Replace. Replace.
Gear shift	Poor 1—2 shift, excessive slippage	<ul style="list-style-type: none"> Fluid pressure leakage to overdrive clutch due to wear or breakage of O/D case seal ring Regulator valve sticking Faulty second brake Broken O-ring of second brake piston 1—2 shift valve sticking Shift solenoid B valve sticking Faulty second coast brake (in "2" range) Intermediate coast modulator valve sticking (in "2" range) 	Replace. Replace. Replace. Replace. Replace. Replace. Replace. Replace.
	Poor 2—3 shift, excessive slippage	<ul style="list-style-type: none"> Fluid pressure leakage to overdrive clutch due to wear or breakage of O/D case seal ring Worn direct clutch bushing Direct clutch slipping 2—3 shift valve sticking Shift solenoid A valve sticking Foreign material caught in direct clutch piston check ball 	Replace. Replace. Replace. Replace. Replace. Replace.
	Poor start or surging in "D" range	<ul style="list-style-type: none"> Regulator valve sticking Fluid pressure leakage of forward clutch due to wear or breakage of O/D case seal ring Malfunction of forward clutch 	Replace. Replace. Replace.

Condition	Possible Cause	Correction
Gear shift	Poor 3—4 shift, excessive slippage	<ul style="list-style-type: none"> Faulty overdrive brake Faulty overdrive clutch 3—4 shift valve sticking Shift solenoid B valve sticking
	Poor start or juddering in "R" range	<ul style="list-style-type: none"> Fluid pressure leakage of direct clutch due to wear or breakage of oil center support seal ring Worn direct clutch
	Excessive shock on 1—2 shift	<ul style="list-style-type: none"> Regulator valve sticking Faulty one-way clutch Faulty accumulator, second brake piston
	Excessive shock on 2—3 shift	<ul style="list-style-type: none"> Regulator valve sticking Faulty accumulator, direct clutch piston
	Excessive shock on 3—4 shift	<ul style="list-style-type: none"> Regulator valve sticking
	Non operate lock-up system	<ul style="list-style-type: none"> Lock-up control valve sticking Solenoid No.2 (Lock-up solenoid) valve sticking Faulty torque converter
Abnormal noise	Noise (sucking) on starting	<ul style="list-style-type: none"> Low A/T fluid level
	Abnormal noise in "P" or "N" range	<ul style="list-style-type: none"> Low A/T fluid level Worn oil pump



60A50-7B1-58-1S



60A50-7B1-58-2S

LINE PRESSURE TEST

Purpose of this test is to check operating conditions of each part by measuring fluid pressure in fluid pressure line.

Line pressure test requires following conditions.

- Automatic fluid is at normal operating temperature (70 to 80°C/158–176°F).
- Fluid is filled to proper level (between FULL HOT and LOW HOT on dipstick).

1. Apply parking brake securely and place checks against wheels.

2. Attach oil pressure gauge to fluid pressure check hole in transmission case.

Special Tool

(A) : 09925-37810

CAUTION:

After attaching oil pressure gauge, check that no fluid leakage exists.

3. Depress foot brake fully, run engine at idle and stall and then check fluid pressure in "D" or "R" range.

CAUTION:

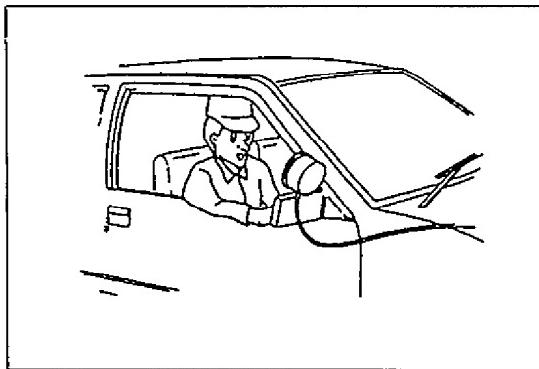
Do not continue running engine at stall speed longer than 5 seconds.

Engine running mode	Line pressure	
	"D" range	"R" range
At idle speed	3.7–4.1 kg/cm ² 53–58 psi	5.5–6.1 kg/cm ² 79–86 psi
At stall speed	9.5–11.0 kg/cm ² 136–156 psi	13.2–15.7 kg/cm ² 188–233 psi

Chek result	Possible cause
Line pressure higher than standard level in each range	<ul style="list-style-type: none"> • Malfunctioning regulator valve • Malfunctioning throttle valve • Maladjusted A/T throttle cable
Line pressure lower than standard level in each range	<ul style="list-style-type: none"> • Defective O/D clutch • Defective oil pump • Malfunctioning throttle valve • Malfunctioning regulator valve • Maladjusted A/T throttle cable
Line pressure lower than standard level only in "D" range	<ul style="list-style-type: none"> • Fluid leakage from forward clutch • Defective O/D clutch • Leakage from "D" range fluid pressure circuit
Line pressure lower than standard level only in "R" range	<ul style="list-style-type: none"> • Fluid leakage from direct clutch • Defective O/D clutch • Fluid leakage from reverse brake • Fluid leakage from "R" range fluid circuit

4. Tightening torque of transmission case plug:

15–18 N·m (1.5–1.8 kg·m, 11.0–13.0 lb·ft)



60A50-7B1-59-1S

STALL TEST

This test is to check overall performance of automatic transmission and engine by measuring stall speed at "D" and "R" ranges. Be sure to perform this test only when transmission fluid is at normal operating temperature and its level is between FULL and LOW marks.

CAUTION:

- Do not run engine at stall more than 5 seconds continuously, for fluid temperature may rise excessively high.
- After performing stall test, be sure to leave engine running at idle for longer than 30 seconds before another stall test.

1. Apply parking brake and block wheels.
2. Install tachometer.
3. Start engine with select lever shifted to "P".
4. Depress brake pedal fully.
5. Shift select lever to "D" and depress accelerator pedal fully while watching tachometer. Read engine rpm quickly when it has become constant (stall speed).
6. Release accelerator pedal immediately after stall speed is checked.
7. In the same way, check stall speed in "R" range.
8. Stall speed should be within following specification.

Stall speed: 2,300–2,600 r/min

Check result	Possible cause
Lower than standard level	<ul style="list-style-type: none"> • Faulty engine output • Defective torque converter
Higher than standard level in "D" range	<ul style="list-style-type: none"> • Slippery O/D clutch • Slippery forward clutch • Malfunctioning O/D one-way clutch • Malfunctioning one-way clutch No.2 • Low line pressure
Higher than standard level in "R" range	<ul style="list-style-type: none"> • Slippery direct clutch • Slippery reverse brake • Low fluid pressure • Slippery O/D clutch • Defective O/D one-way clutch

ROAD TEST

This test is to check if upshift and downshift take place at specified speeds while actually driving vehicle on a level road.

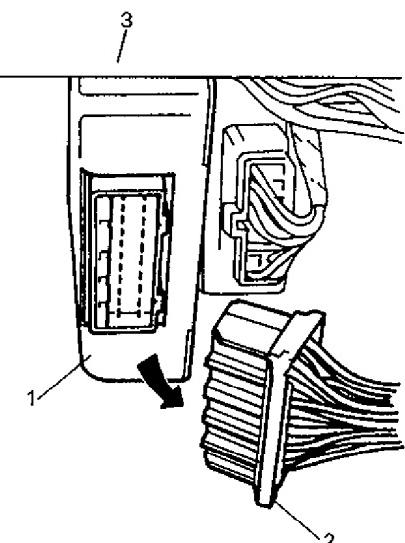
WARNING:

- Carry out test in very little traffic area to prevent an accident.
- Test requires 2 persons, a driver and a tester.

1. Warm up engine.
2. With engine running at idle, shift select lever "D".
3. Accelerate vehicle speed by depressing accelerator pedal gradually.
4. While driving in "D" range, check if gear shift occurs properly as shown in Gear Shift Diagram.
(Page 7B1-49 and 7B1-50.)

Test result	Possible cause
When 1→2 upshift fails to occur	1→2 shift valve stuck
When 2→3 upshift fails to occur	2→3 shift valve stuck
When 3→O/D upshift fails to occur	3→4 shift valve stuck
When gear shift point is incorrect	<ul style="list-style-type: none"> • Maladjusted throttle cable • Defective solenoid No. 1-A or No. 1-B • 1→2, 2→3 or 3→4 shift valve not operating properly

60A50-7B1-60-1S



1. A/T controller
2. Coupler
3. Instrument panel

MANUAL ROAD TEST

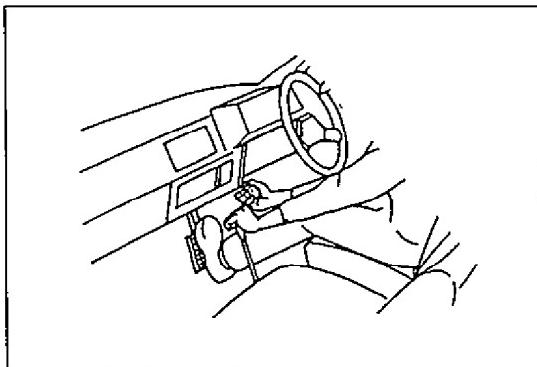
This test checks the gears being used in "L", "2" or "D" range when driven with unoperated gear shift control system. Test drive vehicle on a level road.

NOTE:

Before this test, check diagnosis code.

1. With select lever in "P", start engine and warm it up.
2. After warming up engine, disconnect coupler of A/T controller as shown in figure.
3. With select lever in "L" range, start vehicle and accelerate to 20 km/h (12.5 mile/h). Check in this state that 1st gear is being used.
4. At 20 km/h (12.5 mile/h), shift select lever to 2 range and accelerate to 40 km/h (25 mile/h). Check in this state that 3rd gear is being used.
5. At 40 km/h (25 mile/h), shift select lever to D range with O/D cut switch "ON" and check that O/D gear is used when speed is higher than 40 km/h (25 mile/h).
6. After above checks, stop vehicle then engine, and connect A/T controller coupler.

60A50-7B1-60-2S



60A50-7B1-61-1S

TIME LAG TEST

This test is to check conditions of clutch, reverse brake and fluid pressure. "Time lag" means time elapsed since select lever is shifted with engine idling till shock is felt.

1. With chocks placed before and behind front and rear wheels respectively, depress brake pedal.
2. Start engine.
3. With stop watch ready, shift select lever from "N" to "D" range and measure time from that moment till shock is felt.
4. Similarly measure time lag by shifting select lever from "N" to "R" range.

Specification for time lag	"N" → "D"	Less than 1.2 sec.
	"N" → "R"	Less than 1.5 sec.

NOTE:

- When repeating this test, be sure to wait at least minute after select lever is shifted back to "N" range.
- Engine should be warmed up fully for this test.

Test result	Possible causes
When "N" → "D" time lag exceeds specification	<ul style="list-style-type: none"> • Low line pressure • Worn forward clutch
When "N" → "R" time lag exceeds specification	<ul style="list-style-type: none"> • Low line pressure • Worn direct clutch • Worn reverse brake

ENGINE BRAKE TEST

WARNING:

Before test, make sure that there is no vehicle behind so as to prevent rear-end collision.

1. While driving vehicle in 3rd gear of "D" range, shift select lever down to "2" range and check if engine brake operates.
2. In the same way as in step 1, check engine brake for operation when select lever is shifted down to "L" range.
3. If engine brake fails to operate in above tests, possible causes for such failure are as follows. Check each part which is suspected to be the cause.

Condition	Possible cause
Fails to operate when shifted down to "2" range	Second coast brake defective
Fails to operate when shifted down to "L" range	Reverse brake defective

60A50-7B1-61-2S

"P" RANGE TEST

1. Stop vehicle on a slope, shift select lever to "P" range and at the same time apply parking brake.
2. After stopping engine, depress brake pedal and release parking brake.
3. Then, release brake pedal gradually and check that vehicle remains stationary.
4. Depress brake pedal and shift select lever to "N" range.
5. Then, release brake pedal gradually and check that vehicle moves.

WARNING:

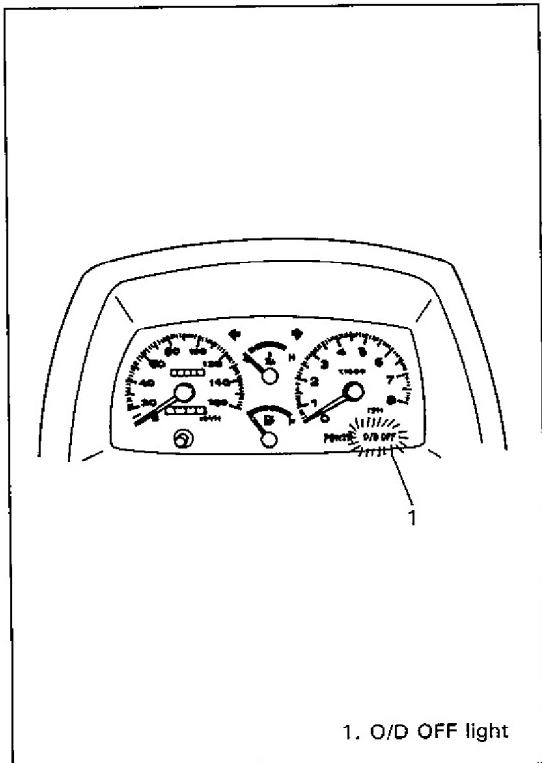
Before test, check to make sure no one is around vehicle or down on a slope and keep watchful for safety during test.

ELECTRONIC SHIFT CONTROL SYSTEM

The A/T controller with self-diagnosis function operates as described below.

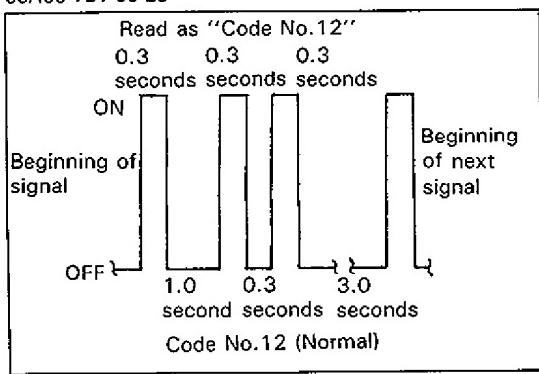
When diagnosing a trouble in the electronic shift control system, use "DIAGNOSTIC FLOW CHART" on the following page.

60A50-7B1-63-1S



1. O/D OFF light

60A50-7B1-63-2S



60A50-7B1-63-4S

SELF-DIAGNOSIS FUNCTION

- When the engine is OFF and the ignition switch is turned ON, the "O/D OFF" light lights for 4 seconds for its bulb check of "O/D OFF" light. (It remains ON when O/D cut switch is ON.)
- Should an abnormality have occurred in the electronic shift control system while the ignition switch is ON or the engine running, the "O/D OFF" light flashes to warn occurrence of an abnormality to the driver and at the same time the area where the abnormality has occurred is stored in the A/T controller memory and it remains in the memory even when the ignition switch is turned OFF.
- The affected area in the memory is indicated by flashing of "O/D OFF" light when the diag. switch terminal is grounded.

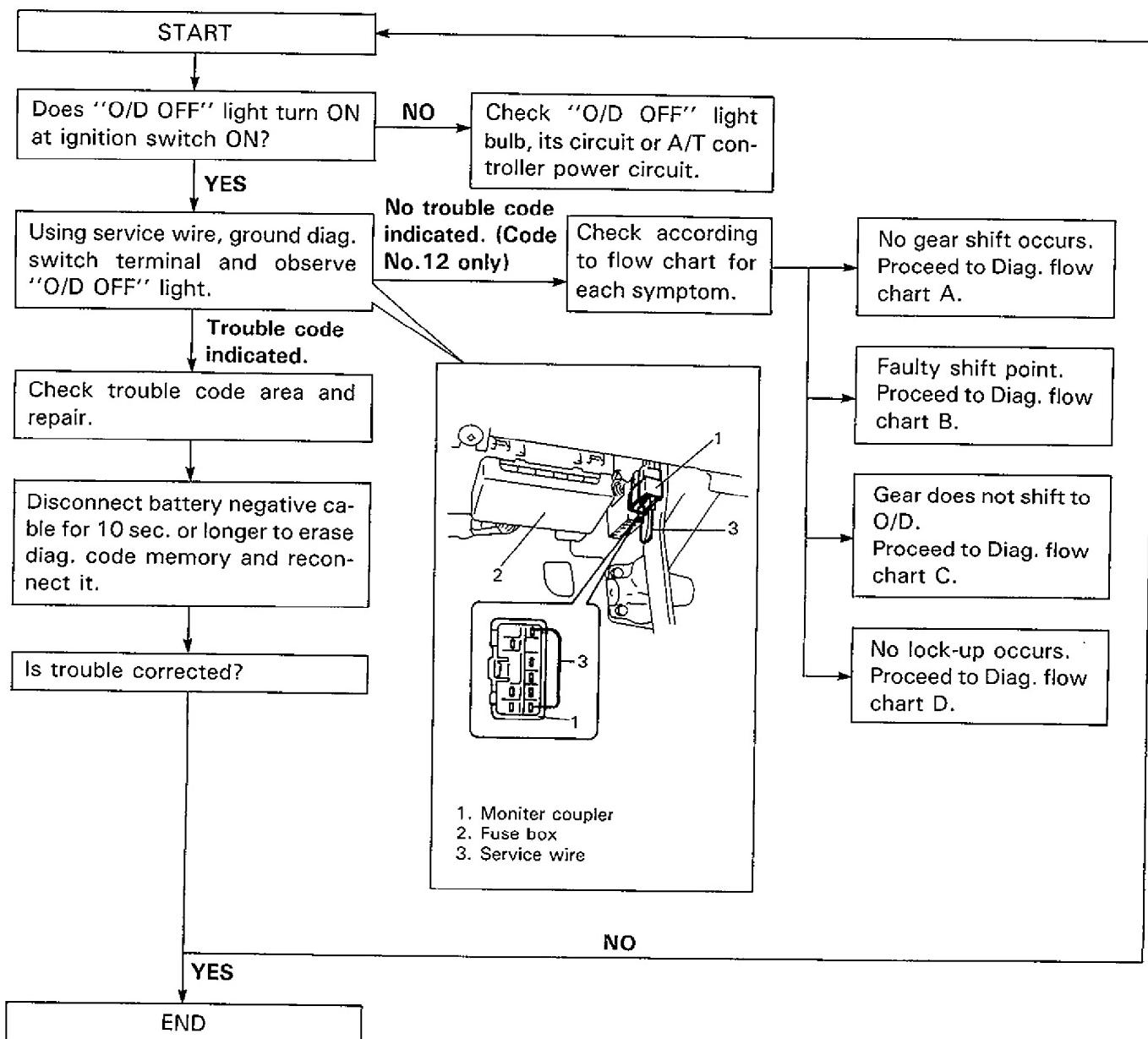
PRECAUTION IN IDENTIFYING DIAG. CODE

- Before checking the diag. code, be sure not to disconnect the A/T controller or battery negative cable. Or the memory will be erased.
- Following the Code No. 12 (indicated 3 times) each trouble code is indicated 3 times. Write it down so as not to forget it. When an abnormality exists in more than one area, their code Nos. are indicated from the smallest to larger numbers.

PRECAUTION ON TROUBLESHOOTING

- "Normal operating temperature" in the diagnostic flow chart means that the engine cooling water temperature is 80°C (176°F) and A/T fluid temperature is 70–80°C (158–176°F).
- Do not connect an ohmmeter, voltmeter, etc. directly (with the coupler disconnected) to the A/T controller terminal. It may cause damage to the controller.

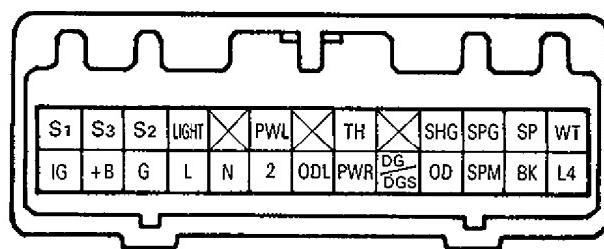
DIAGNOSTIC FLOW CHART



Diagnosis Code Table

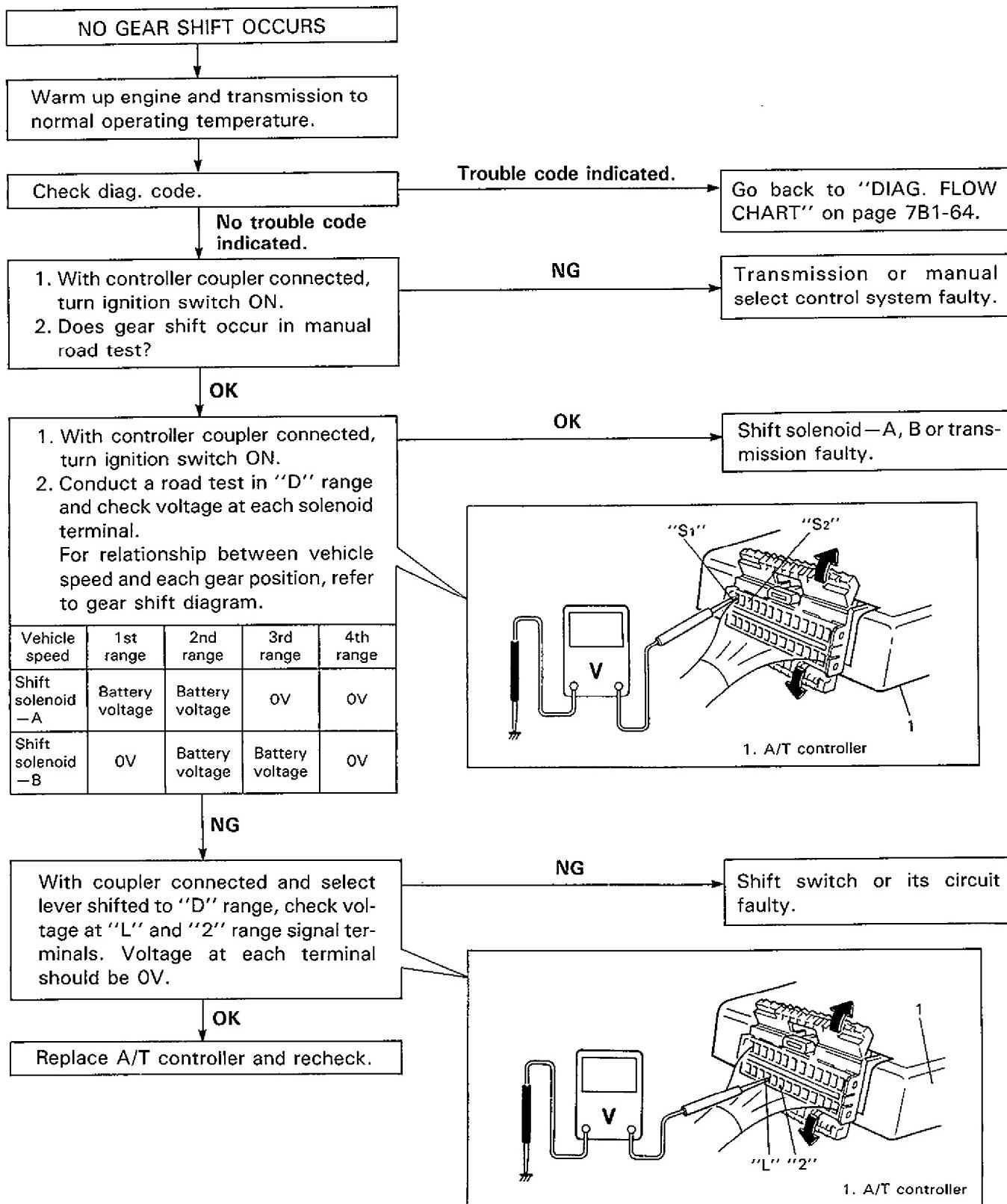
Code No.	Diagnostic Area	Diagnosis	Fail-safe Function
12	—	Normal	—
21	Solenoid No.1—A (Shift solenoid—A)	Shift solenoid—A opened	Shift solenoid—B 1st, 2nd and 3rd gears ON, 4th (O/D) gear OFF For shift position, refer to figure on page 7B1-48.
22		Shift solenoid—A short-circuit	
23	Solenoid No.1—B (Shift solenoid—B)	Shift solenoid—B opened	Shift solenoid—A 1st gear ON, 2nd, 3rd and 4th gears OFF For shift position, refer to figure on page 7B1-48.
24		Shift solenoid—B short-circuit	
25	Solenoid No.2 (Lock-up solenoid)	Lock-up solenoid opened	Lock-up solenoid OFF
26		Lock-up solenoid short-circuit	
31	Vehicle speed sensor	Defective sensor (signal from A/T disconnected) or short-circuit	Signal from speedometer sensor is used.
36		Defective both sensors (signal from A/T and speedometer disconnected or short-circuit)	—
32	Throttle position sensor	Defective sensor, short-circuit or defective engine ECM	Throttle opening is controlled as closed.
33		Defective sensor, open circuit or defective engine ECM	
34	Shift switch	Defective switch (more than two shift switches of "N, 2 and L" turned ON simultaneously) or short-circuit	Priority order is "L, 2 and N".

60A50-7B1-65-1S

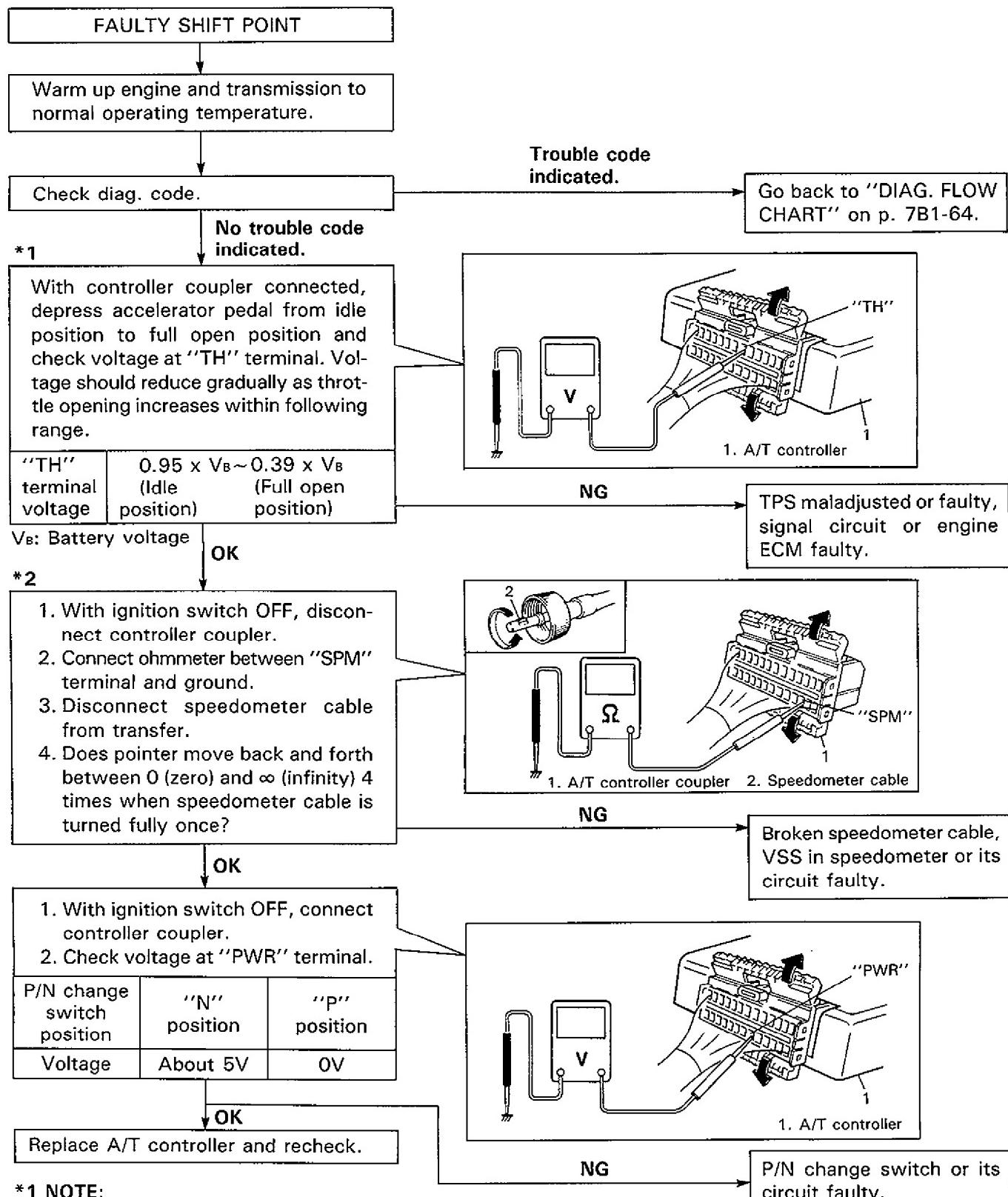
Terminal Positions

60A50-7B1-65-2S

DIAGNOSTIC FLOW CHART A



DIAGNOSTIC FLOW CHART B

***1 NOTE:**

As another method, low voltage time of PWM signal at "TH" terminal can be checked and it should be as follows.

	When idling	When in full-throttle
Low voltage time (msec.)	0.75–1.02	7.83–9.50

***2 NOTE:**

VSS signal can be also checked as follows.

Drive at 40 km/h (25 mile/h) in T/F HIGH gear position and check pulse signal frequency at "SP" and "SPM" terminals. It should be as follows.

	"SP"	"SPM"
Frequency	106–113 Hz	25–27 Hz

DIAGNOSTIC CHART C

NO GEAR SHIFT TO O/D

Warm up engine and transmission to normal operating temperature.

Check diag. code.

Trouble code indicated.

Go back to "DIAG. FLOW CHART" in p. 7B1-64.

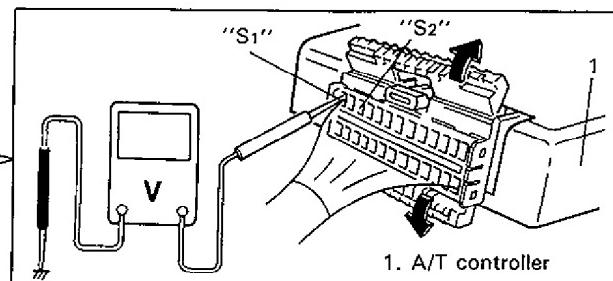
No trouble code indicated.

1. With ignition switch OFF, disconnect controller coupler.
2. Does gear shift to O/D (4th gear) occur in manual road test?

OK

NG

Manual select control system or transmission faulty.



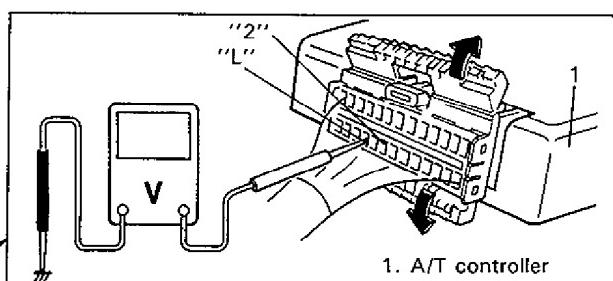
1. With ignition switch OFF, connect controller coupler.
 2. Conduct road test in "D" range and check voltage at each solenoid terminal.
- | Vehicle speed | 1st range | 2nd range | 3rd range | 4th range |
|------------------------|-----------------|-----------------|-----------------|-----------|
| Shift solenoid -A (S1) | Battery voltage | Battery voltage | 0V | 0V |
| Shift solenoid -B (S2) | 0V | Battery voltage | Battery voltage | 0V |

OK

Shift solenoid-A, B or transmission faulty.

1. With controller coupler connected, turn ignition switch ON.
2. With select lever shifted to "D" range, check voltage at "L" and "2" range signal terminals. It should be 0V.

NG

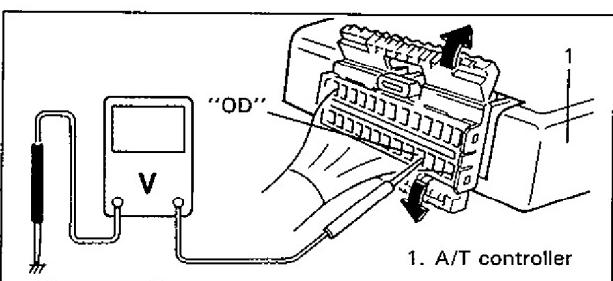


NG

Shift switch or its circuit faulty.

- With coupler connected, check voltage at "O/D" terminal.
- | O/D switch position | OFF | ON |
|---------------------|----------|----|
| Voltage | About 5V | 0V |

OK



OK

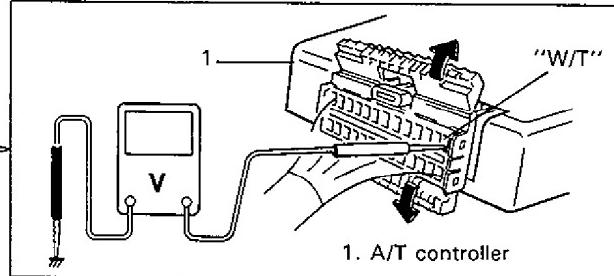
Faulty O/D switch or its circuit shorted.

To be continued

Continued

With coupler connected, check voltage at "W/T" terminal.

Engine cooling water temp.	Below 55°C (131°F)	Above 60°C (140°F)
Voltage	0V	Battery voltage



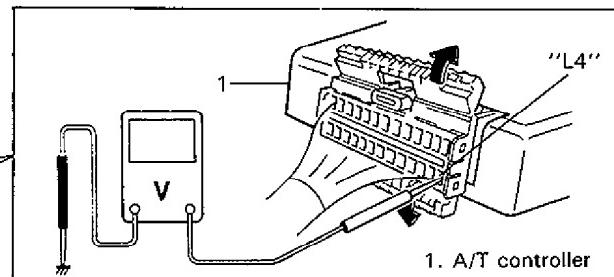
OK

NG

Faulty WTS, faulty engine ECM or its circuit shorted.

With coupler connected, check voltage at "L4" terminal.

Transfer gear position	"4L" position	Other position
Voltage	0V	Battery voltage



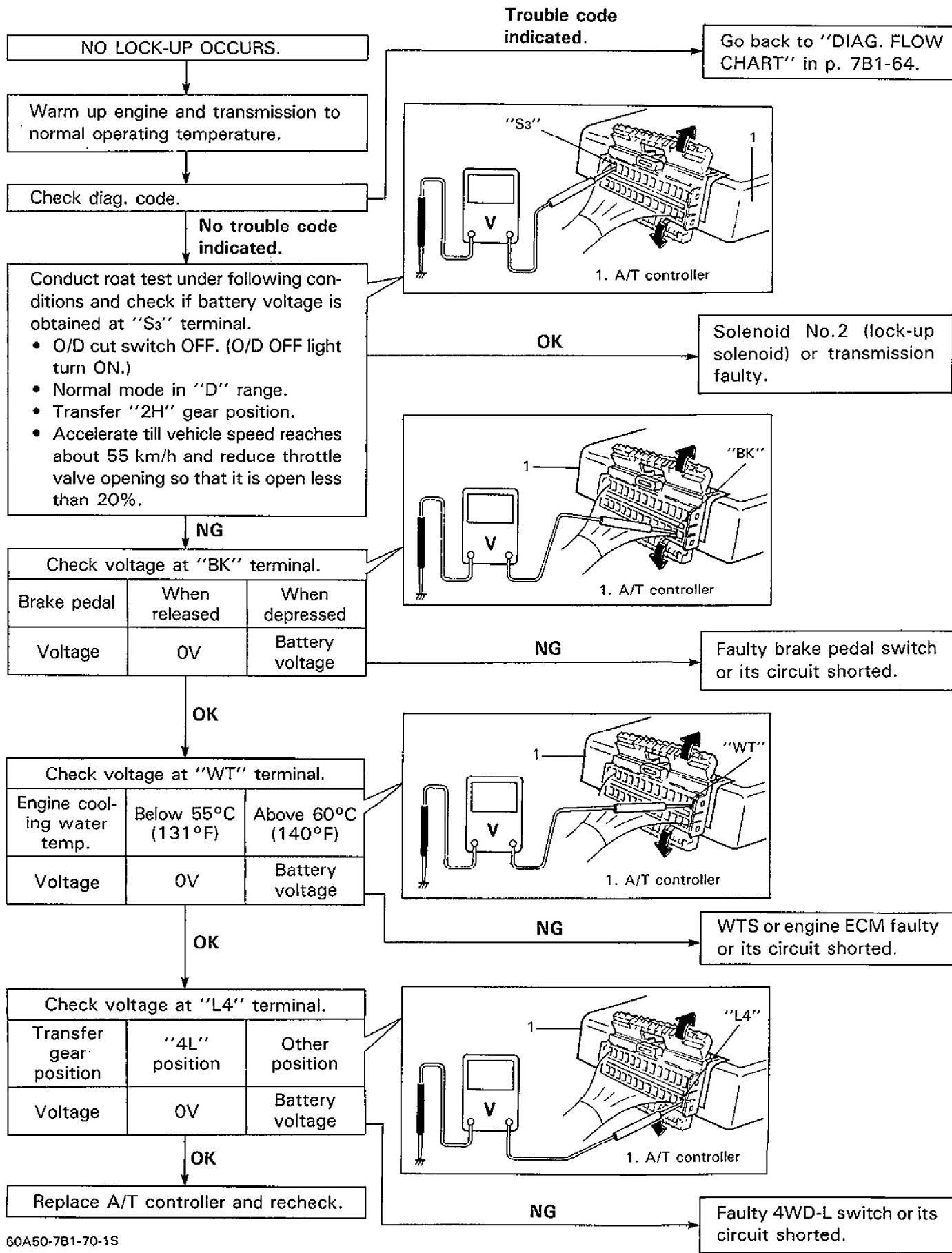
NG

Faulty 4WD-L switch or its circuit shorted.

OK

Replace A/T controller and recheck.

DIAGNOSTIC FLOW CHART D



ON VEHICLE SERVICE

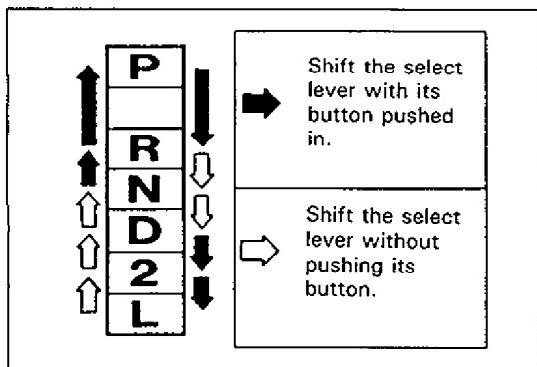
MAINTENANCE SERVICE

FLUID LEVEL

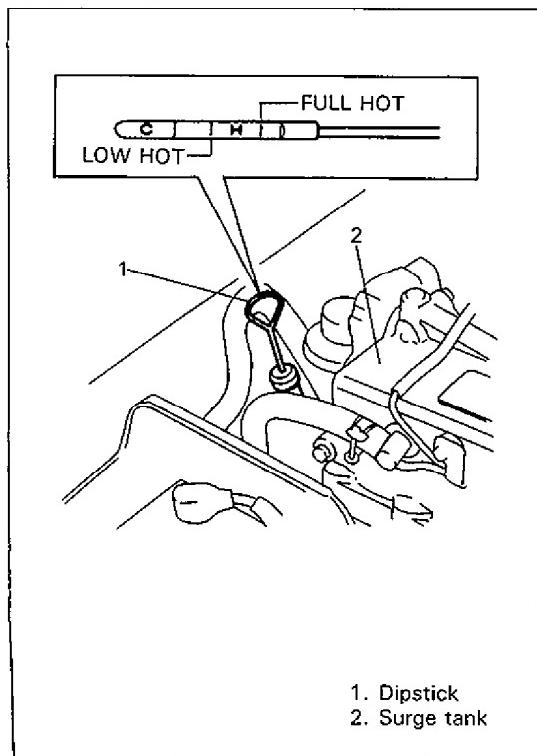
LEVEL CHECK AT NORMAL OPERATING TEMPERATURE

1. Stop vehicle and place it level.
2. Apply parking brake and place chocks against wheels.
3. With selector at P position, start engine.
4. Warm up engine till fluid temperature reaches normal operating temperature (70—80°C/158—176°F). As a guide to check fluid temperature, warm up engine till engine coolant temperature gauge indicated around 1 unit above C point.

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60A50-7B1-71-3S



5. Keep engine idling and shift selector slowly to L and back to P position.
6. With engine idling, pull out dipstick, wipe it off with a clean cloth and put it back into place.

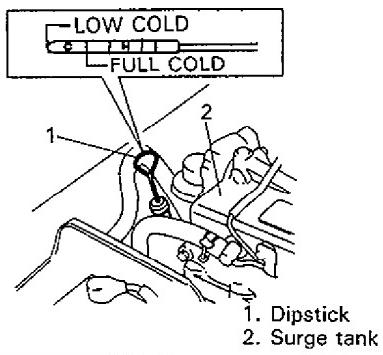
7. Pull out dipstick again and check fluid level indicated on it. Fluid level should be between FULL HOT and LOW HOT. If it is below LOW HOT, add DEXRON-II or its equivalent up to FULL HOT.

Fluid specification
DEXRON-II automatic transmission fluid

NOTE:

- DO NOT RACE ENGINE while checking fluid level, even after the engine start.
- DO NOT OVERFILL. Overfilling can cause foaming and loss of fluid through breather. Then slippage and transmission failure can result.
- Bringing the level from LOW HOT to FULL HOT requires 0.3 liters (0.64/0.53 US/Imp. pt).
- If vehicle was driven under high load such as pulling a trailer, fluid level should be checked about half an hour after it is stopped.

60A50-7B1-71-4S



60A50-7B1-72-1S

LEVEL CHECK AT ROOM TEMPERATURE

The fluid level check at room temperature performed after repair or fluid change before test driving is just preparation for level check of normal operating temperature. The checking procedure itself is the same as that described previously. If the fluid level is between FULL COLD and LOW COLD, proceed to test drive. And when the fluid temperature has reached the normal operating temperature, check fluid level again and adjust it as necessary.

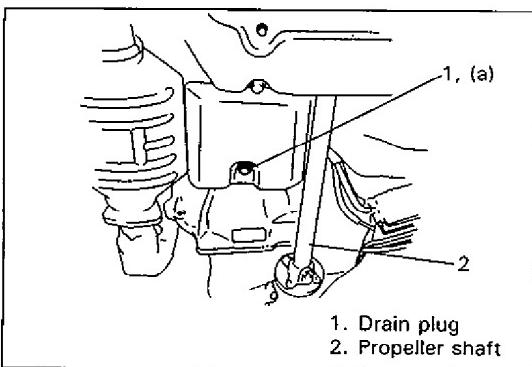
FLUID CHANGE INTERVALS

The transmission operating temperature resulting from the type of driving conditions under which the vehicle is used, is the main consideration in establishing the proper frequency of transmission fluid changes.

Change the transmission fluid every 20,000 km (12,000 miles) or 12 months if the vehicle is usually driven under one or more of the following conditions which are considered severe transmission service.

1. In heavy city traffic. Where the outside temperature regularly reaches 32°C (90°F).
2. In very hilly or mountainous areas.
3. Frequent trailer pulling.
4. Commercial use, such as taxi, police vehicle, delivery service, or rent-a-car. If the vehicle is not used under any of these conditions, change the fluid every 160,000 km (100,000 miles).

60A50-7B1-72-2S



60A50-7B1-72-4S

CHANGING FLUID

1. Lift up vehicle.
2. With engine is cool, remove drain plug from oil pan and drain A/T fluid.
3. Install drain plug.

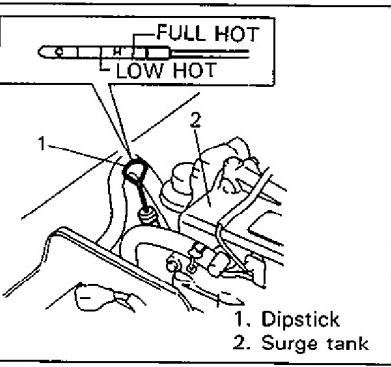
Tightening Torque

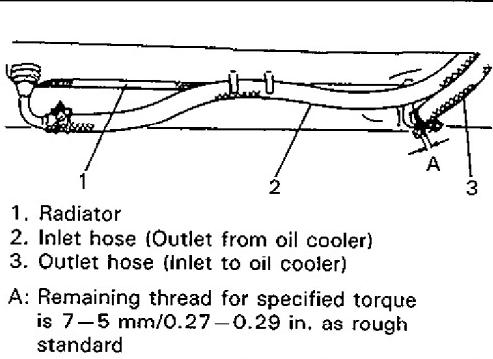
(a) : 18–27 N·m (1.8–2.7 kg·m, 13.5–19.5 lb·ft)

4. Lower vehicle and fill proper amount of DEXRON-II or equivalent.
5. Check fluid level according to procedure described under LEVEL CHECK AT NORMAL OPERATING TEMPERATURE.

Fluid specification	
DEXRON-II automatic transmission fluid	
Fluid capacity	
When draining from drain plug hole	2.5 liters (5.28/4.40 US/lmp.pt.)
When overhauling	6.9 liters (14.58/12.14 US/lmp.pt.)

60A50-7B1-72-5S





60A50-7B1-73-1S

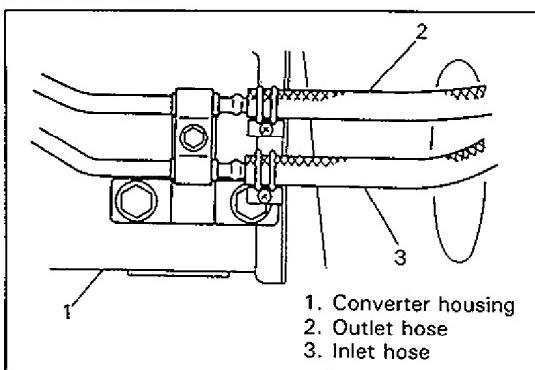
OIL COOLER HOSES

The rubber hoses for the oil cooler should be replaced every 60,000 km (36,000 miles) or every 3 years. When replacing them, be sure to note the following.

- to replace clamps at the same time
- to insert hose as far as its limit mark
- to tighten clamps to specified torque

Tightening Torque:

1.5 N·m (0.15 kg·m, 1 lb·ft)

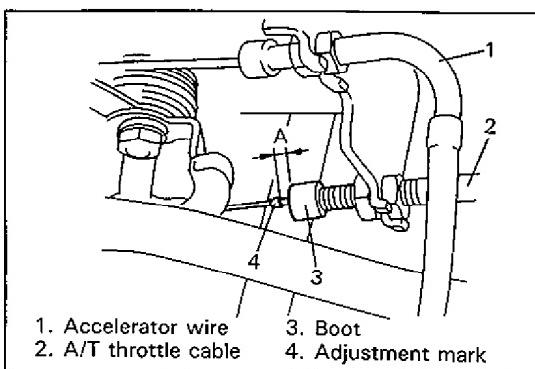


60A50-7B1-73-2S

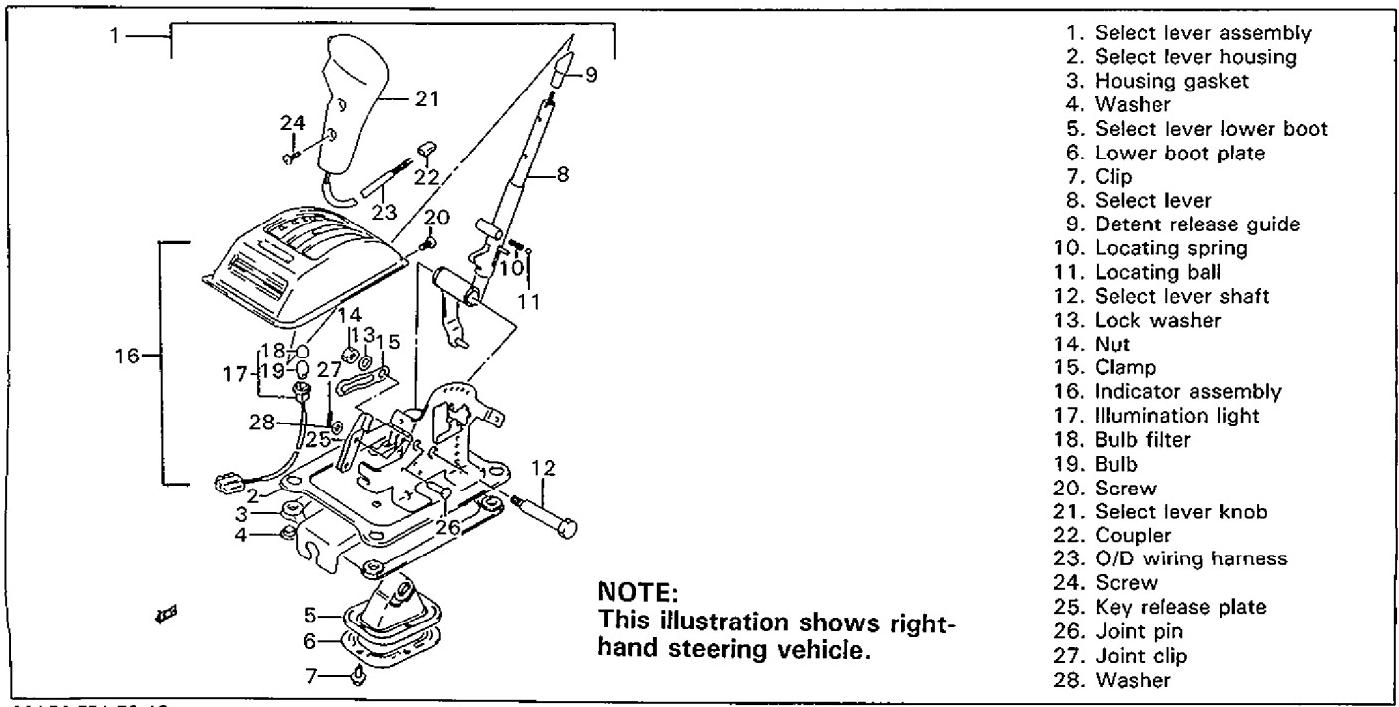
A/T THROTTLE CABLE**ADJUSTMENT**

Measure distance between tip end of cable adjustment mark and end of boot (indicated as "A" in figure).

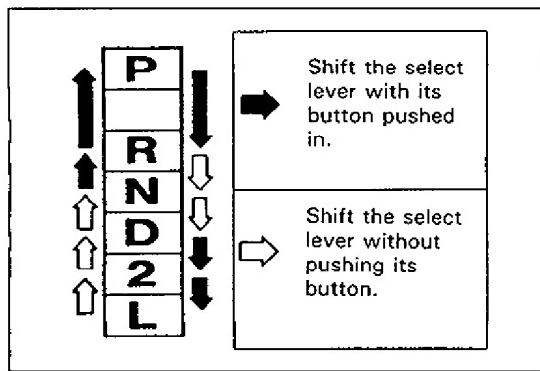
Standard distance "A" : 0.8–1.5 mm (0.031–0.059 in)



60A50-7B1-73-3S

SELECT LEVER

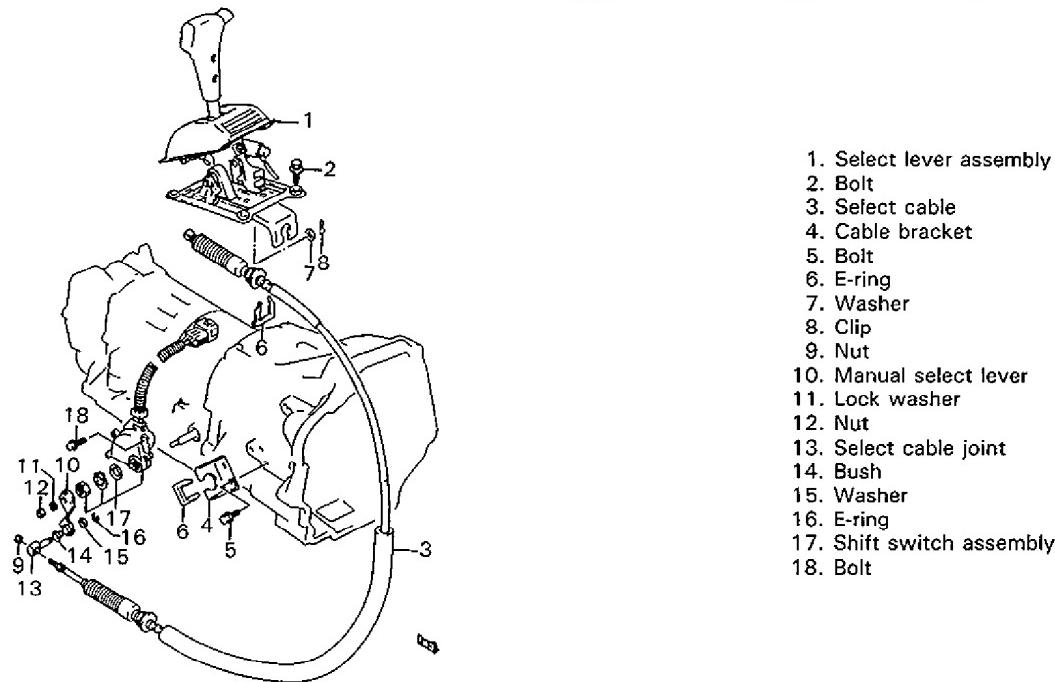
60A50-7B1-73-4S



60A50-7B1-74-1S

INSPECTION

Check select lever for smooth and clear-cut movement and position indicator for correct indication.
For operation of select lever, refer to left figure.

SELECT CABLE/SHIFT SWITCH

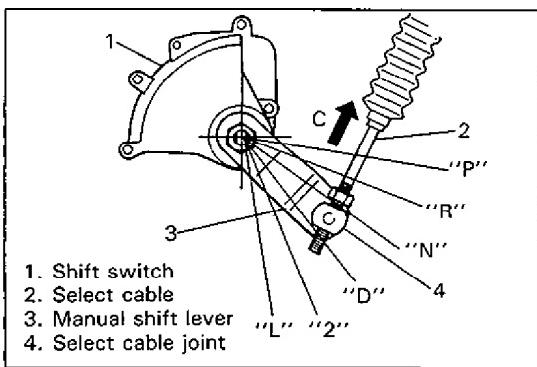
60A50-7B1-74-2S

SELECT CABLE**ADJUSTMENT**

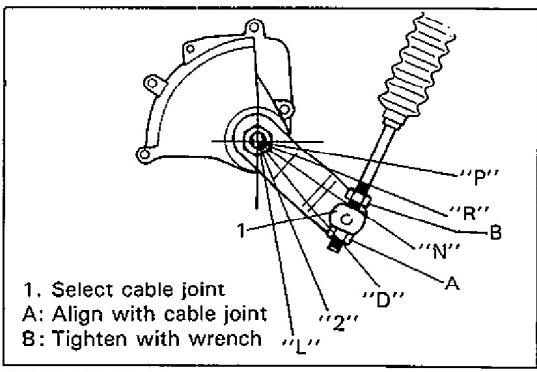
- Before tightening cable end nut, shift select lever to "N".
- Also shift manual shift lever to "N".

NOTE:

- Make sure that nut and cable joint have clearance under above conditions.
- If select cable has been moved, push it in arrow C direction as shown in figure at the left till it stops and then confirm that select lever is in "N" position.



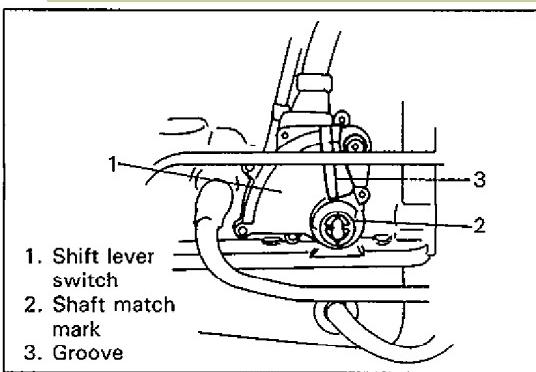
60A50-7B1-74-4S



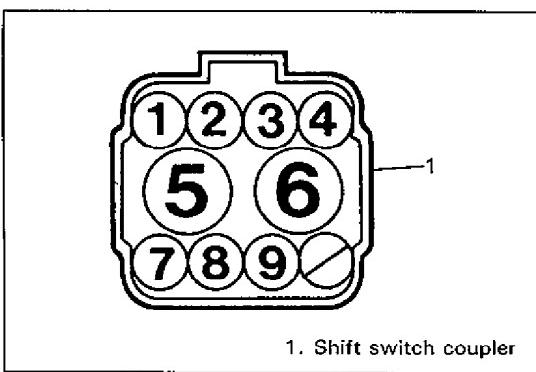
60A50-7B1-74-5S

- Turn nut A by hand till it contacts manual select cable joint. Then tighten nut B with wrench.
- After select cable was installed, check for the following.

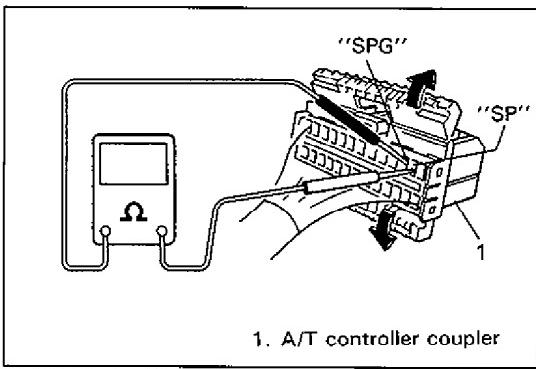
- Push vehicle with select lever shifted to "P".
Vehicle should not move.
- Vehicle can not be driven in "N".
- Vehicle can be driven in "D", "2" and "L".
- Vehicle can be backed in "R".



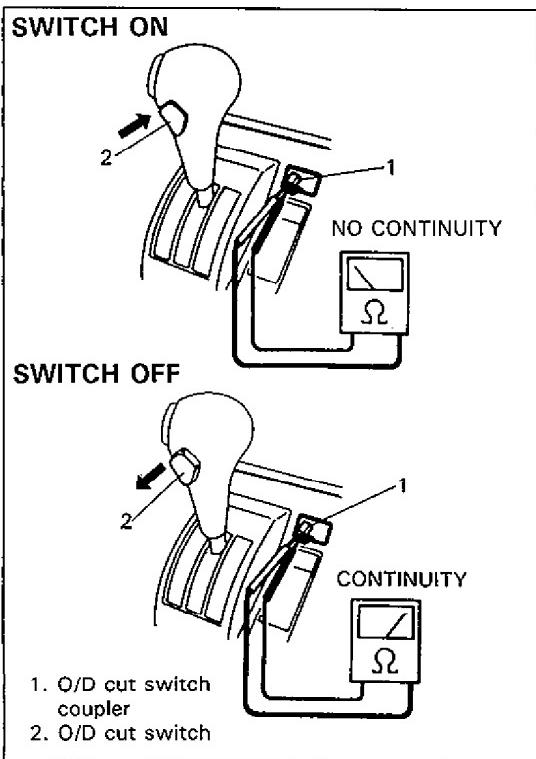
60A50-7B1-75-1S



60A50-7B1-75-2S



60A50-7B1-75-3S



60A50-7B1-75-4S

SHIFT SWITCH

INSPECTION & ADJUSTMENT

- Shift select lever to "N" range.
- Fix shift switch with groove in shift switch and match mark on shaft aligned.
- Check that engine starts in "N" and "P" ranges but it doesn't start in "D", "2", "L" or "R" range. Also, check that back-up lamp lights in "R" range.
- If faulty condition cannot be corrected by adjustment, disconnect shift switch coupler and check that continuity exists as shown below by moving select lever.

	Terminal No.	1	2	3	4	5	6	7	8	9
Switch position	Color	Yellow/Blue	Yellow/Green	Yellow/Red	Red	Black/Red	Black/Yellow	Blue/Green	Bleu/Red	Yellow
P						○	○		○	○
R					○				○	
N						○	○	○		○
D				○						○
2			○							○
L	○									○

VEHICLE SPEED SENSOR

INSPECTION

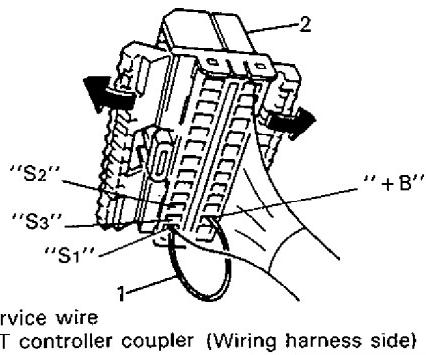
Disconnect A/T controller coupler and check resistance valve between SP terminal and SPG terminal.

Vehicle speed sensor resistance value: 387—473 Ω

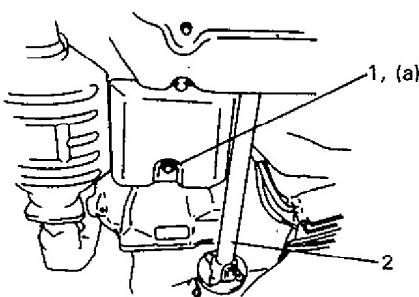
O/D CUT SWITCH

INSPECTION

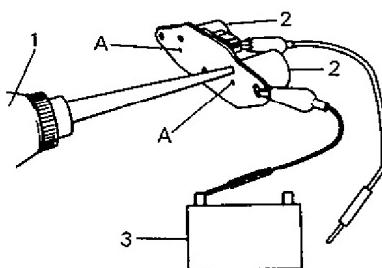
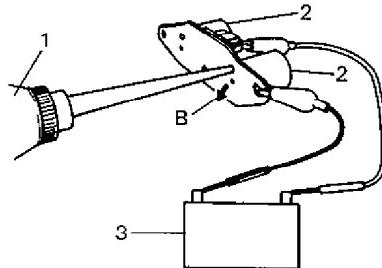
Disconnect O/D cut switch coupler and check its continuity as shown in left figures.



60A50-7B1-76-1S



60A50-7B1-76-2S

WITHOUT BATTERY VOLTAGE**WITH BATTERY VOLTAGE**

1. Oiler (with transmission fluid)
2. Solenoid A: Hole (Should be dry)
3. Battery B: Exhausting fluid

60A50-7B1-76-4S

SOLENOIDS (Shift solenoids & Lock-up solenoid)**INSPECTION**

With coupler of A/T controller disconnected and using service wire as shown at the left, check each solenoid for clicking sound.

Shift solenoid-A	S ₁
Shift solenoid-B	S ₂
Lock-up solenoid	S ₃

REMOVAL

- Pull out dipstick and lift up vehicle.
- With engine cooled, remove drain plug from oil pan and drain A/T fluid.
- Install drain plug with gasket.
- Remove exhaust pipe bracket and disconnect front propeller shaft from front differential.
- Remove oil pan bolts.
- Disconnect oil cooler pipe from transmission case and remove oil pan.
- Remove oil tubes.
- Remove solenoid No.1 (shift solenoid) or solenoid No.2 (lock-up solenoid).

Tightening Torque

(a): 18–27 N·m (1.8–2.7 kg·m, 13.5–19.5 lb·ft)

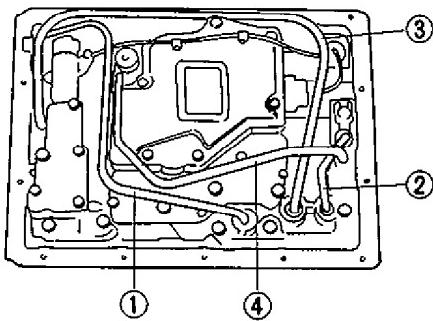
OPERATION CHECK

Whenever shift solenoids and lock-up solenoid are removed from transmission, verify their valve function physically before they are reinstalled.

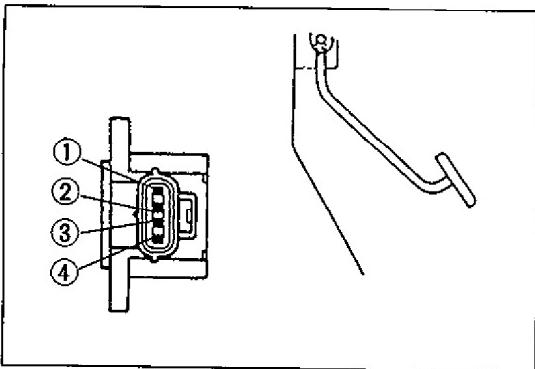
- Apply oiler to solenoid and give compression by hands and then check to be sure that transmission fluid from oiler does not come out of holes in solenoid when battery voltage is not conducted.
- Under the same conditions as above, conduct battery voltage and then make sure that fluid comes out with vigor.

NOTE:

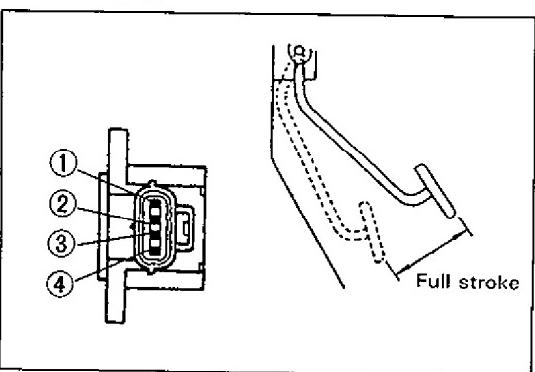
- If fluid does not come out with vigor in above step 2 inspection, do not re-use that solenoid.
- Figure at the left shows shift solenoid check. Check lock-up solenoid also in the same way.



60A50-7B1-77-1S



60A50-7B1-77-3S



60A50-7B1-77-4S

INSTALLATION

Reverse removal procedure to install solenoid(s) and noting following points.

- For details of solenoid(s) installation, refer to p. 7B1-131. Use new gasket and O-ring.
- Install oil tubes in such order as shown in figure.
- For details of oil pan installation, refer to p. 7B1-139. Use new oil pan gasket.
- Tighten oil cooler pipe flare nut, universal joint flange bolts & nuts and exhaust pipe bracket bolts to specified torque.
- Fill A/T fluid and check fluid level according to procedure described in "CHANGING FLUID" previously.
- Check for fluid leakage after warming up A/T.

THROTTLE POSITION SENSOR

INSPECTION

Disconnect throttle position sensor connector from vehicle harness and measure resistance at connector of throttle position sensor.

At closed throttle

- ① – ④ resistance value: 4.25–8.25 k Ω
 ② – ④ resistance value: 0.3–6.3 k Ω

At full throttle

- ② – ④ resistance value: 3.5–10.3 k Ω

CAUTION:

Perform this inspection with engine stopped after it has been warmed up.

ADJUSTMENT

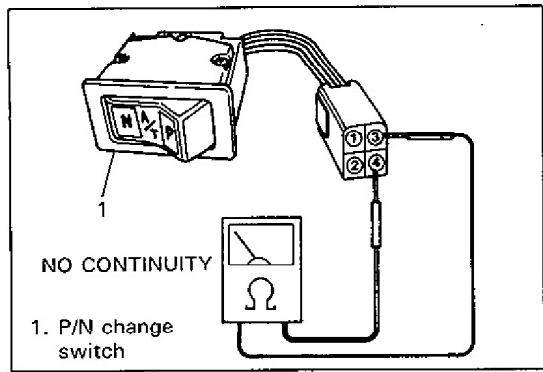
Refer to SECTION 6E1 for adjustment.

P/N CHANGE SWITCH

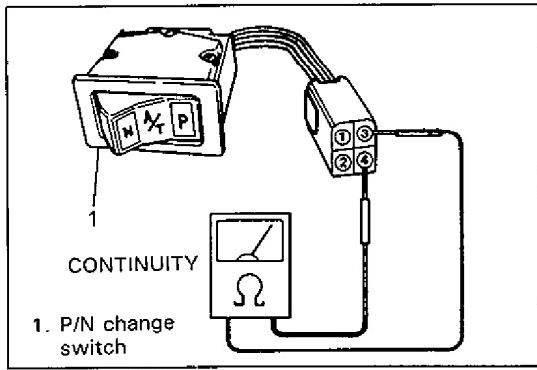
INSPECTION

Check continuity between terminal ③ and terminal ④ as shown at the left.

1. When this switch is in "N" position, there should be no continuity.



60A50-7B1-78-1S



60A50-7B1-78-2S

2. When this switch is in "P" position, there should be continuity.

TRANSMISSION UNIT REPAIR OVERHAUL

GENERAL SERVICE INFORMATION

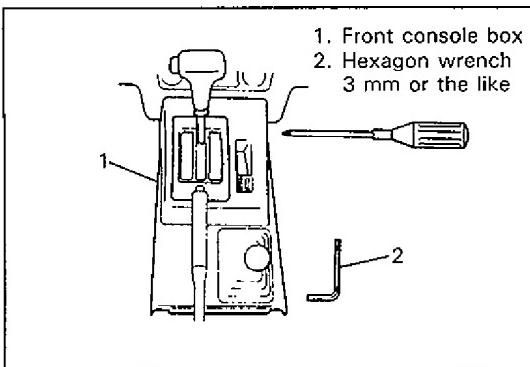
When repairing automatic transmission, it is necessary to conduct the on-vehicle test to investigate where the cause of the trouble lies first.

Then whether overhaul should be done or not is determined. If the transmission is disassembled without such preliminary procedure, not only the cause of the trouble would be unknown, but also a secondary trouble may occur and often time would be wasted.

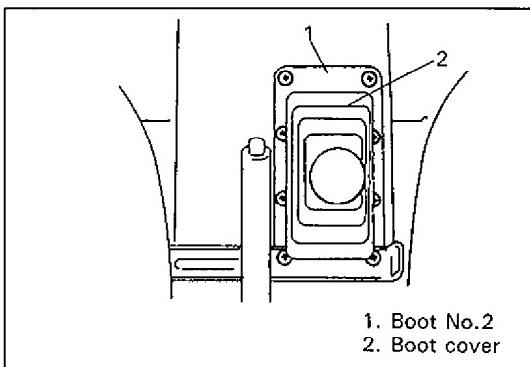
PRECAUTION

Make sure to wash dirt off from the transmission so that no such dirt will enter the transmission during dismounting and remounting.

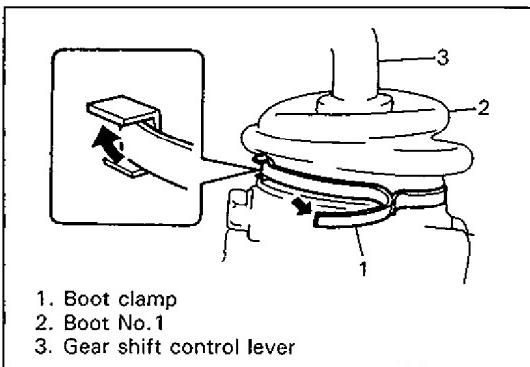
60A50-7B1-79-1S



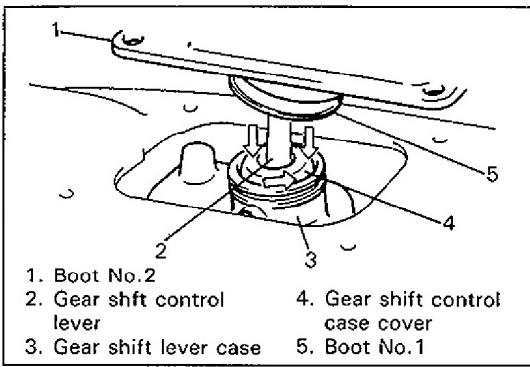
60A50-7B1-80-1S



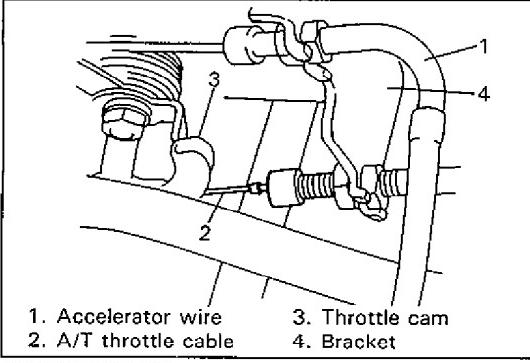
60A50-7B1-80-2S



60A50-7B1-80-3S



60A50-7B1-80-4S



60A50-7B1-80-5S

DISMOUNTING OF TRANSMISSION WITH TRANSFER

IN CABIN

1. Remove clips at the front of rear console box.

NOTE:

To remove clip, push in its center pin first.

2. Remove screws at the front and clips at the rear, and then remove front console box.

3. Remove boot cover and boot No.2.

4. Remove boot clamp and then remove boot No. 1 from transfer gear shift lever case.

5. With gear shift control case cover pushed down with fingers, turn it to counterclockwise and take out shift control lever.

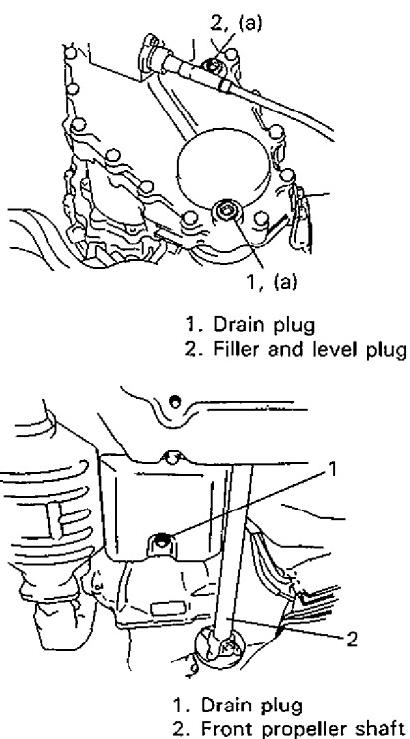
6. Take out transfer shift control lever in similar manner as described above.

IN ENGINE ROOM

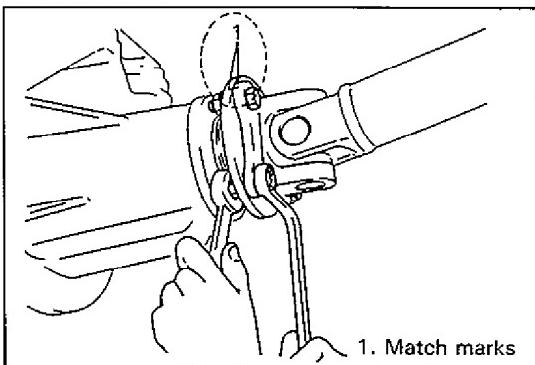
1. Remove battery, dipstick and oil filler tube.
2. Disconnect A/T throttle cable from throttle cam and bracket.
3. Disconnect wiring harness couplers.
4. Remove starter. But don't disconnect its wiring harness.
5. Remove transmission to engine bolts.

NOTE:

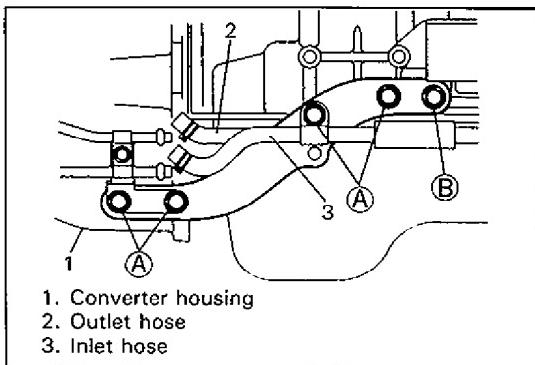
Right side bolt is longer.



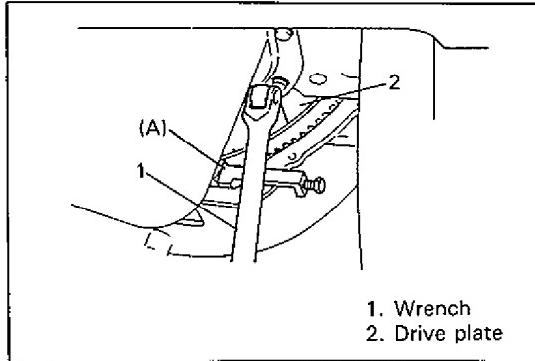
60A50-7B1-81-1S



60A50-7B1-81-3S



60A50-7B1-81-4S

**ON LIFT**

1. Drain transfer oil.

NOTE:

If automatic transmission is overhauled later on, draining A/T fluid at this point will facilitate work.

Tightening Torque

(a): 18—28 N·m (1.8—2.8 kg·m, 13.5—20.0 lb·ft)

2. Before removing propeller shaft, give match marks on joint flange and propeller shaft as shown in left figure.
3. Remove universal joint flange bolts and take out rear propeller shaft.
4. Likewise, take out front propeller shaft.
5. Remove nut from the end of select cable and E-ring from bracket to set cable free.
6. Remove select cable bracket by removing its 2 bolts.
7. Remove exhaust pipe No.1 and No.2.
8. Remove case left stiffener.
9. Loosen clamps and disconnect oil cooler hoses from pipes.

NOTE:

To avoid leakage of transmission fluid, plug open ends of oil cooler pipes and hoses right after they are disconnected.

10. Among case right stiffener mounting bolts, remove bolt **A** in figure at the left and loosen bolt **B**.
11. Remove torque converter housing lower plate.
12. Holding drive plate stationary with special tool, remove 3 torque converter mounting bolts with wrench.

Special Tool

(A) : 09927-56010

60A50-7B1-81-5S

13. Remove engine to transmission nuts.
14. Remove speedometer cable end nut and disconnect cable.
15. Apply transmission jack and take off rear mounting member, torque stopper member and torque stopper bush by removing its bolts.
16. With transmission and transfer assemblies held up on jack, move them to the rear and lower them including torque converter.

60A50-7B1-82-1S

WARNING:

Transmission and transfer assemblies may tilt rearward on jack. It is recommended to use an auxiliary arm of jack for the purpose of safety.

60A50-7B1-82-2S

AFTER DISMOUNTING

WARNING:

Be sure to keep transmission and transfer assemblies horizontal throughout the work. Should they be tilted, torque converter may fall off and cause personal injury and A/T fluid may flow out.

1. Remove wiring harness and breather hoses.
2. Remove transfer by removing its 12 bolts.

60A50-7B1-82-3S

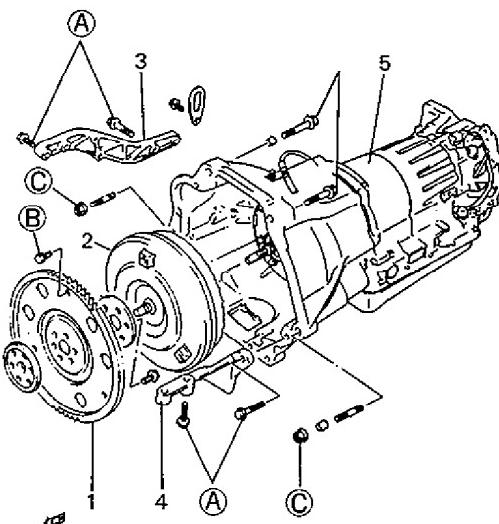
REMOUNTING

WARNING:

When moving transmission assembly with torque converter equipped in it, be sure to keep it horizontal. Tilting it with its front facing down may allow converter to fall off, whereby an injury may result.

For remounting, reverse dismounting procedure. Use specified torque as given below and left.

Tightening torque	N·m	kg-m	lb-ft
Exhaust pipe to manifold nuts	50–70	5.0–7.0	36.5–50.5
• Muffler to exhaust pipe bolts • Exhaust pipe bracket bolts	40–60	4.0–6.0	29.0–43.0
Universal joint flange bolts and nuts	50–60	5.0–6.0	36.5–43.0
Oil hose clamps	1.5	0.15	1
• Oil filler tube bolts • Select cable bracket bolts	18–28	1.8–2.8	13.5–20.0



(A) : 40–60 N·m
4.0–6.0 kg-m
29.0–43.0 lb-ft

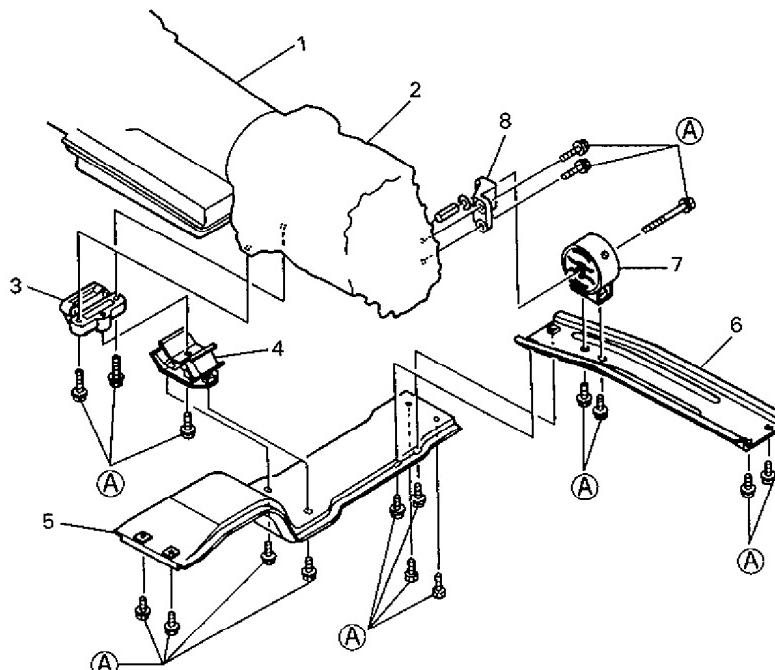
(B) : 60–70 N·m
6.0–7.0 kg-m
43.5–50.5 lb-ft

(C) : 70–100 N·m
7.0–10.0 kg-m
51.0–72.0 lb-ft

1. Drive plate
2. Torque converter
3. Case right stiffener
4. Case left stiffener
5. Automatic transmission

60A50-7B1-83-1S

- Clamp wiring harness and hoses securely.
- Refer to page 7B1-74 for adjusting procedure of select cable.
- Refer to page 7B1-73 for tuning of A/T throttle cable.
- Follow fluid level check procedure in page 7B1-72 for refilling automatic transmission fluid and its level adjusting.
- Connect battery, and confirm that engine and transmission function acceptably.
- When remounting drive plate, use specified bolts.



(A) : 40–60 N·m
4.0–6.0 kg-m
29.0–43.0 lb-ft

1. Automatic transmission
2. Transfer
3. Engine rear mounting bracket
4. Engine rear mounting
5. Engine rear mounting member
6. Torque stopper member
7. Torque stopper bush
8. Torque stopper bracket

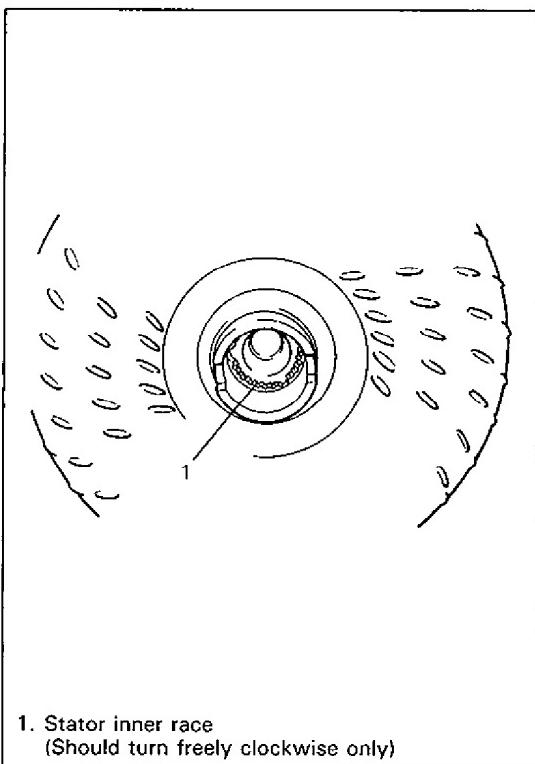
60A50-7B1-83-2S

TORQUE CONVERTER DIAGNOSIS

STATOR ASSEMBLY FREEWHEELS

If the stator roller clutch becomes ineffective, the stator assembly freewheels at all times in both directions. With this condition, the vehicle tends to have poor acceleration from a standstill. If poor acceleration problems are noted, what to be checked first are that the exhaust system is not blocked, the engine is running properly and the transmission is in 1st gear when starting out.

60A50-7B1-84-1S



60A50-7B1-84-2S

STATOR ASSEMBLY REMAINS LOCKED UP

If the stator assembly remains locked up at all times, the engine rpm and vehicle speed will tend to be limited or restricted at high speeds. The vehicle performance when accelerating from a standstill will be normal. Engine overheating may be noted. Visual examination of the converter may reveal a blue color from the overheating that will result.

Under above conditions, if the converter has been removed from the transmission, the stator roller clutch can be checked by inserting a finger into the splined inner race of the roller clutch and trying to turn the race in both directions. The inner race should turn freely clockwise, but be heavy to turn counterclockwise.

NOTE:

- Converter placed with its flange upright does not fit for this inspection.
- For proper checking, position converter with its flange horizontal.
- Turn stator inner race clockwise as quickly as possible with finger, then turn reversely at the same speed and feel difference of enertia.

DO NOT REPLACE CONVERTER FOR FOLLOWING CONDITIONS:

1. The fluid has an odor, is discolored, and there is no evidence of metal particles. There is no indication of existence of internal damage, or oil pump damage. Dump out as much fluid as possible from the converter and replace only the oil pump screen in the pan.
2. A small amount of wear (sometimes referred to as fretting wear) appears on the hub where the oil pump drive gear is located. A certain amount of such wear is normal for both the hub and oil pump gear. Neither the converter nor the oil pump assembly should be replaced.

60A50-7B1-84-4S

PRECAUTIONS FOR DISASSEMBLY AND REASSEMBLY

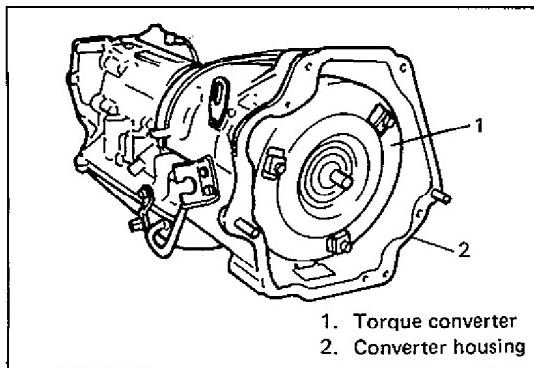
As the automatic transmission consists of high precision components, following cautions should be strictly observed when handling its parts in disassembly and reassembly.

- Select a clean place free from dust and dirt for overhauling.
- Place a rubber mat on the work bench to protect parts from damage.
- Work gloves or shop cloth should not be used. (Use a nylon cloth or a paper towel.)
- When separating the case joint, do not pry with a screwdriver or such but tap with a plastic hammer lightly.
- Make sure to wash dirt off from the transmission so that no such dirt will enter the transmission during disassembly and reassembly.
- Wash the disassembled parts in ATF (Automatic Transmission Fluid) or kerosene (using care not to allow ATF or kerosene to get on your face, etc.) and confirm that each fluid passage is not clogged by blowing air into it. But use ATF to wash the disc, resin washers and rubber parts.
- Replace each gasket, oil seal and O-ring with a new one.
- Apply ATF to sliding or rotating parts before reassembly.
- A new disc should be soaked in ATF at least 2 hours before use.
- For service materials, do not use anything other than those listed below.

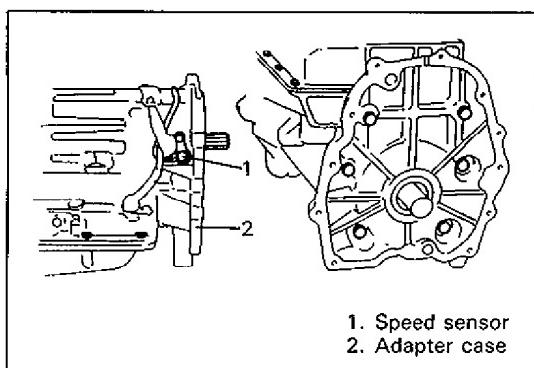
Service materials	Use
Automatic Transmission Fluid [DEXRON-II] (99000-22760)	Applied to rotating part, sliding part and disc before assembly.
SUZUKI SUPER GREASE C (99000-25030)	Used to retain thrust bearing, bearing race, thrust washer and ball.

PART INSPECTION AND CORRECTION TABLE

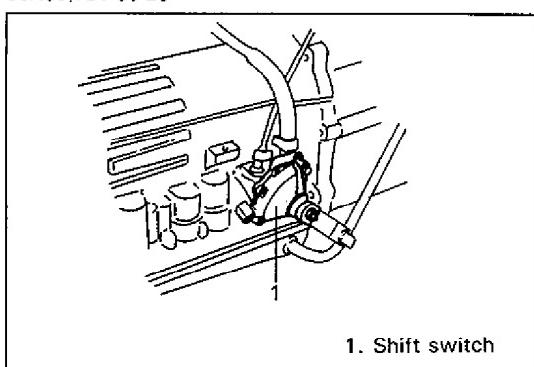
Part	Inspect for	Correction
Casted part, machined part	Small flaw, burr Deep or grooved flaw Clogged fluid passage Flaw on installing surface, residual gasket Crack	Remove with oil stone. Replace part. Clean with air or wire. Remove with oil stone or replace part. Replace part.
Bearing	Unsmooth rotation Streak, pitting, flaw, crack	Replace Replace
Bushing, thrust washer	Flaw, burr, wear, burning	Replace
Oil seal, gasket	Flawed or hardened seal ring Worn seal ring on its periphery or side Piston seal ring, oil seal, gasket, etc.	Replace Replace Replace
Gear	Flaw, burr Worn gear tooth	Replace Replace
Splined part	Burr, flaw, torsion	Correct with oil stone or replace
Snap ring	Wear, flaw, distortion No interference	Replace Repalce
Thread	Burr Damage	Replace Replace
Spring	Settling, sign of burning	Replace
Clutch disc, brake disc	Wear, burning, distortion, damaged claw	Replace
Clutch plate, brake plate	Wear, burning, distortion, damaged claw	Replace
Sealing surface (where lip contacts)	Flaw, rough surface, stepped wear, foreign material	Replace



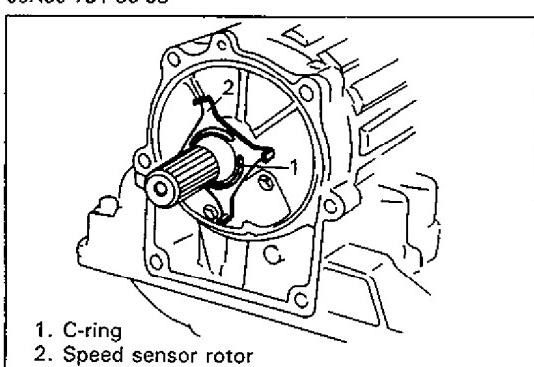
60A50-7B1-86-1S



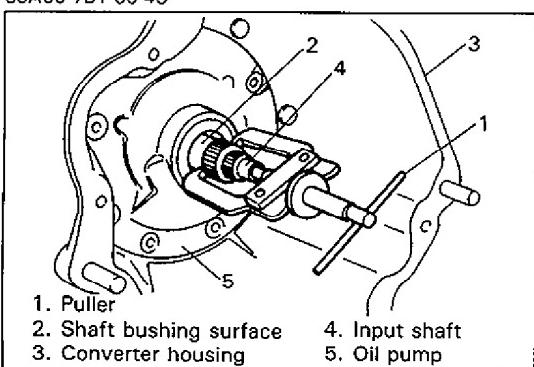
60A50-7B1-86-2S



60A50-7B1-86-3S



60A50-7B1-86-4S



60A50-7B1-86-5S

UNIT DISASSEMBLY

- Extract torque converter. And remove oil filler tube and dipstick.

CAUTION:

**Remove torque converter as much straight as possible.
Leaning it may cause to damage oil seal lip.**

- Remove speed sensor.

- Remove 6 adapter case fixing bolts and then remove adaptor case.

NOTE:

Use care not to cause damage to oil seal.

- Remove gasket.

- Remove shift switch.

- Remove C-ring and then remove speed sensor rotor.

NOTE:

Use care not to loose rotor stop key.

- Remove oil pump by using puller.

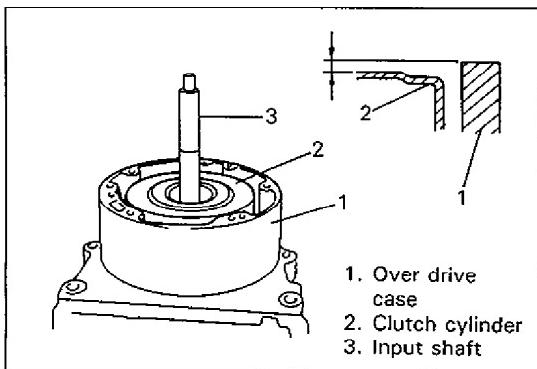
NOTE:

Use care not to cause damage to shaft bushing surface.

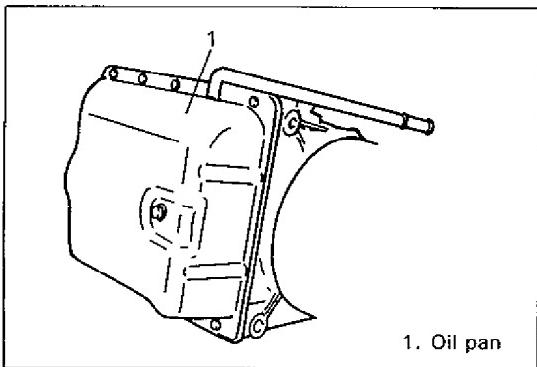
- Remove bearing at the rear of oil pump.

- Remove O-ring from oil pump.

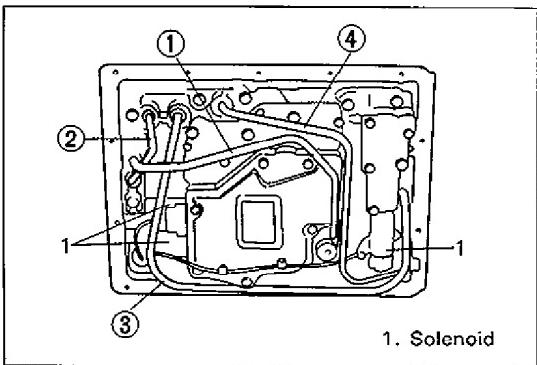
- Holding input shaft by hand, remove converter housing.



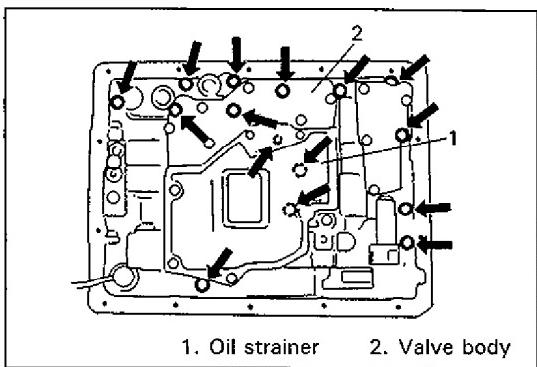
60A50-7B1-87-1S



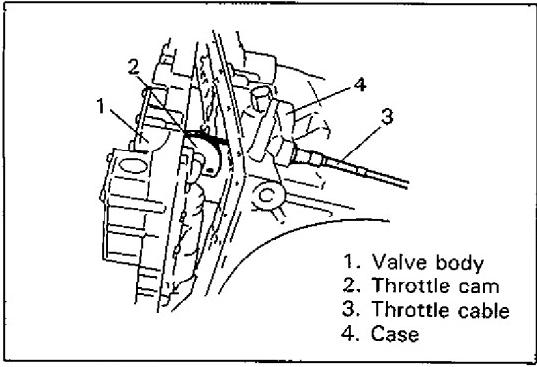
60A50-7B1-87-2S



60A50-7B1-87-3S



60A50-7B1-87-4S



60A50-7B1-87-5S

11. Check dimensions of overdrive (O/D) case surface and clutch cylinder surface for reassembly.
12. Remove overdrive (O/D) clutch assembly by holding input shaft.
13. Remove O/D case, bearing and bearing race.

NOTE:

Confirm direction of bearing and bearing race for reassembly.

14. Remove oil pan.

NOTE:

- Hold oil pan with oil pan side down to prevent foreign material in oil pan from entering valve body.
- If iron powder is found, it is possible that bearing, gear or clutch plate is worn.

15. Remove oil tubes.

NOTE:

Refer to figure at the left for order of their removal.

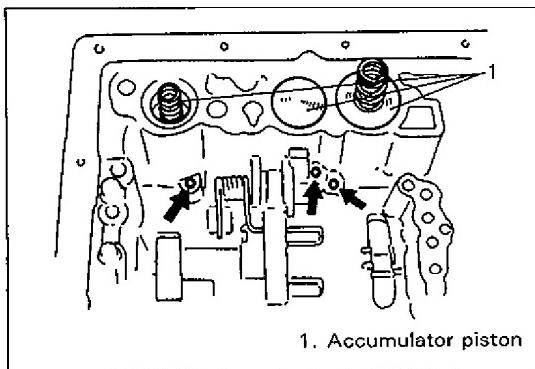
16. Remove coupler from solenoid.

17. Remove oil strainer.

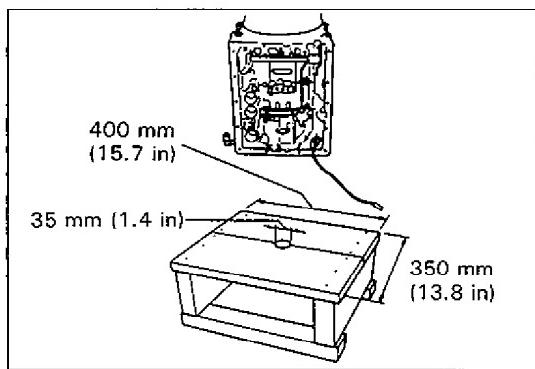
18. Remove valve body mounting bolts as shown left figure.

19. Lift valve body and disconnect A/T throttle cable from throttle cam.
And remove valve body.

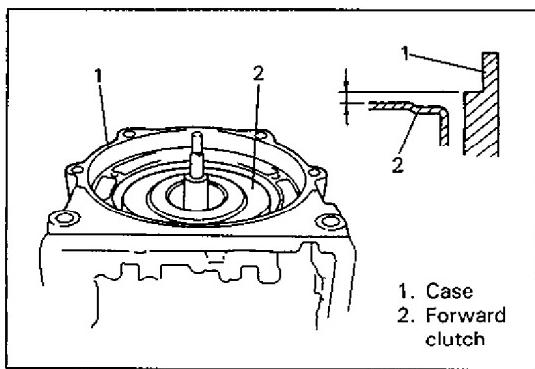
20. Disconnect throttle cable from case.



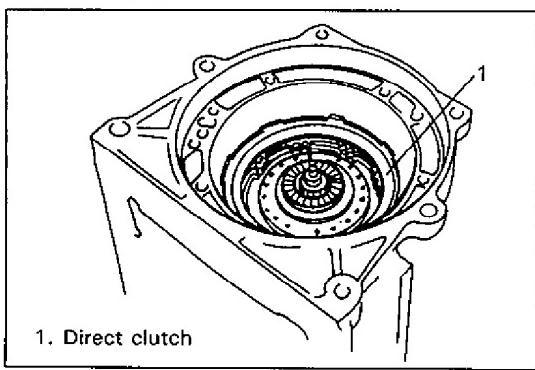
60A50-7B1-88-1S



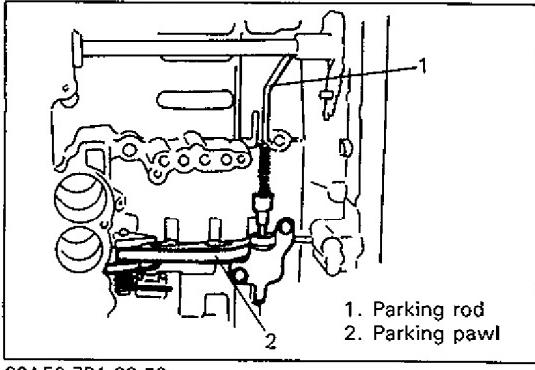
60A50-7B1-88-2S



60A50-7B1-88-3S



60A50-7B1-88-4S



60A50-7B1-88-5S

21. Remove accumulator pistons by blowing air into holes indicated in figure.

NOTE:

Hold accumulator piston with shop cloth while blowing air.

22. Place transmission upright as shown in figure.

NOTE:

- To prevent transmission case from getting damaged, protect its contacting surface with stand by using shop cloth or the like.
- A stand of such size as shown in figure will facilitate work.

23. Check top surface level of forward clutch against case for reassembly.

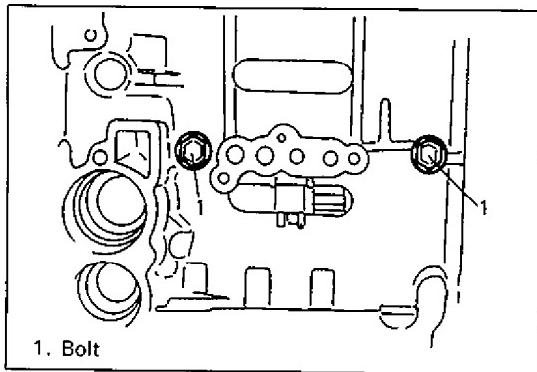
24. Remove forward clutch.

NOTE:

Confirm direction of bearing and bearing race for reassembly.

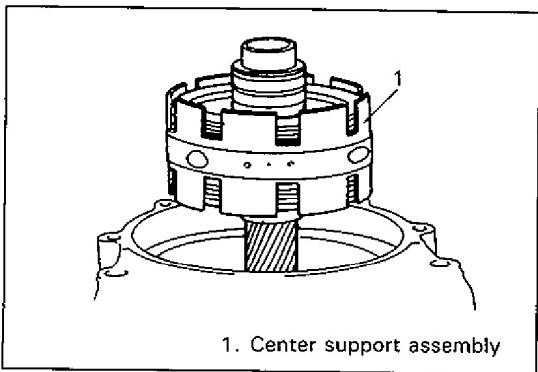
25. Remove direct clutch.

26. Remove parking rod and parking pawl.



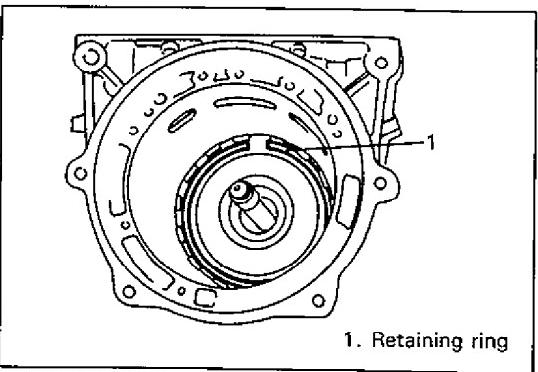
60A50-7B1-89-1S

27. Remove 2 bolts from valve body side to remove center support.



60A50-7B1-89-2S

28. Remove center support assembly.

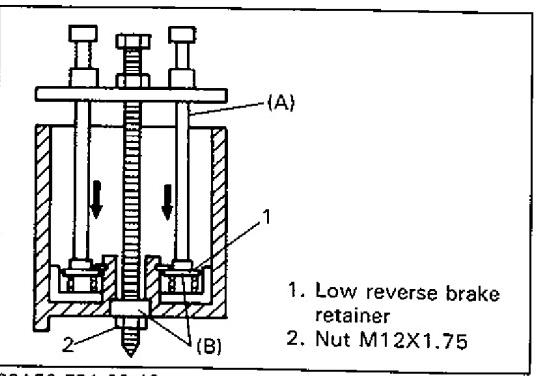


60A50-7B1-89-3S

29. Remove retaining ring, planetary gear assembly and leaf spring.

NOTE:

- Use care not to cause damage to case when removing retaining ring.
- Confirm direction of bearing and bearing race for re-assembly.



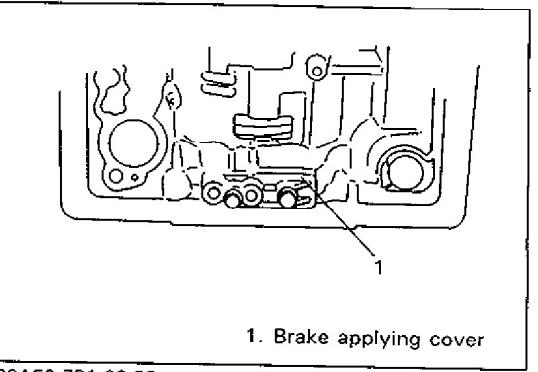
60A50-7B1-89-4S

30. Remove reverse brake retainer.

Special Tool

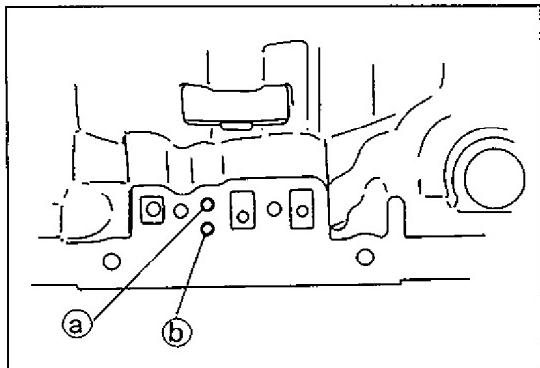
(A) 09926-98390

(B) 09926-98320

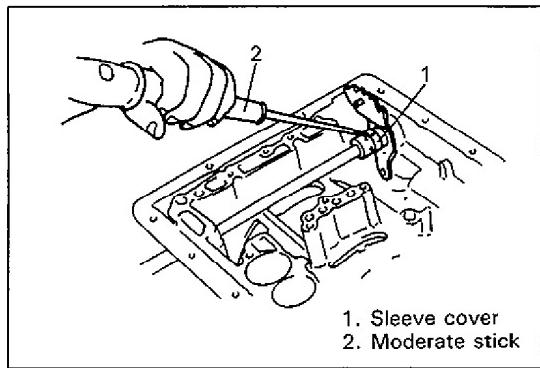


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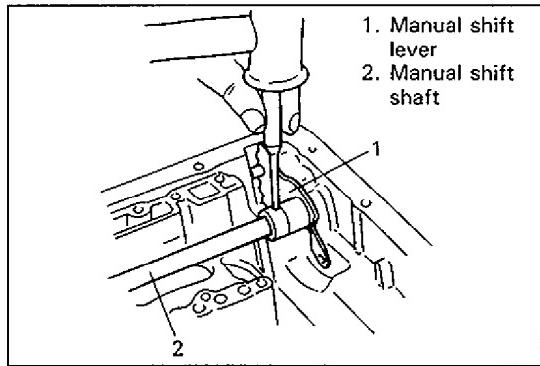
31. Remove brake applying cover.



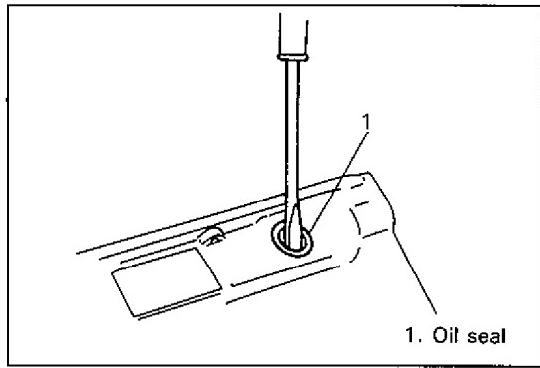
60A50-7B1-90-1S



60A50-7B1-90-2S



60A50-7B1-90-3S



60A50-7B1-90-4S

32. Remove rear action sleeve and reverse brake piston by blowing air into hole **b** with **a** hole closed.

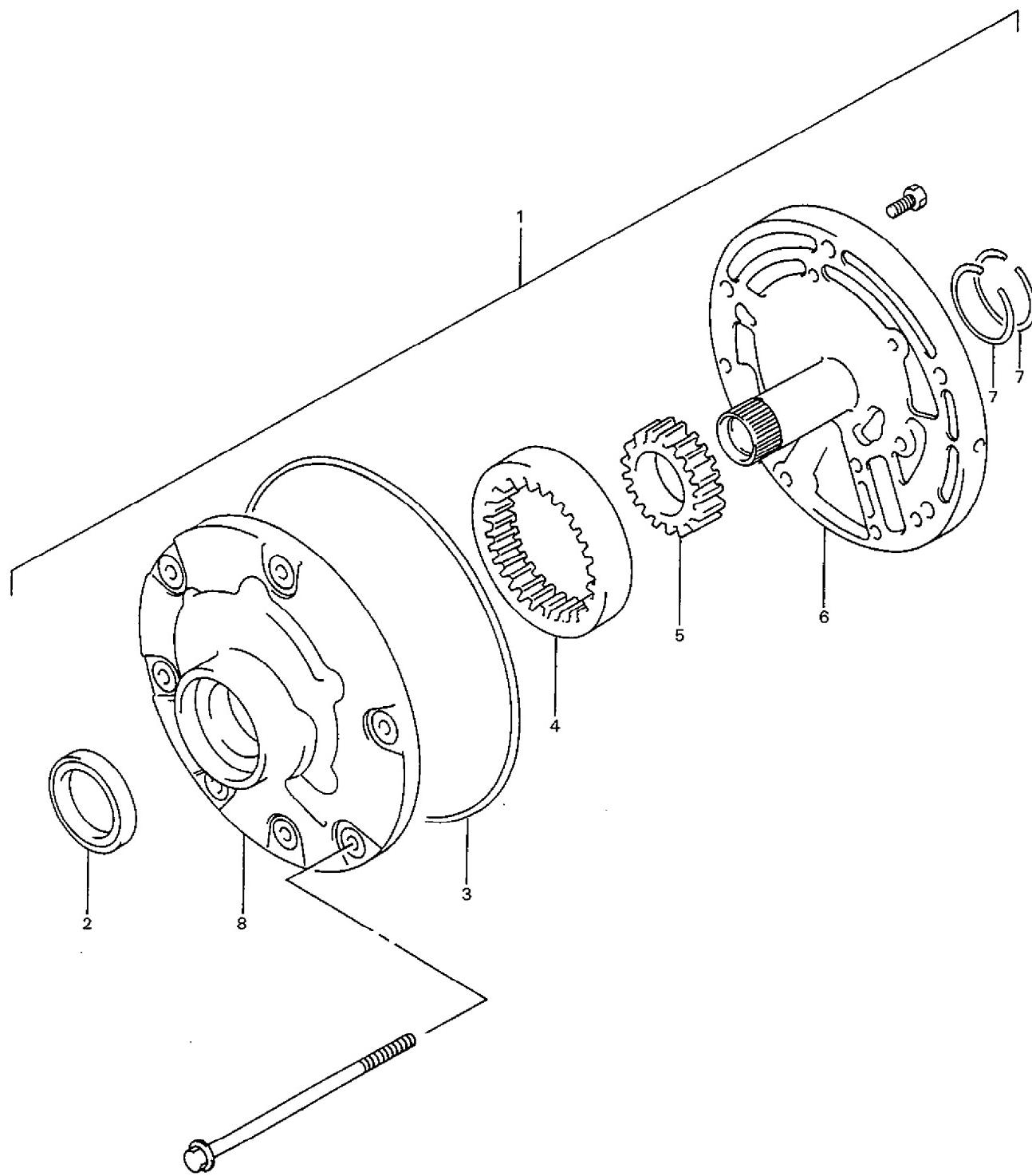
33. Undo caulking of sleeve cover by using moderate stick and move sleeve cover.

34. Using a punch, drive out manual shift lever pin, pull out manual shift shaft and remove manual shift lever. Then remove sleeve cover from manual shift lever.

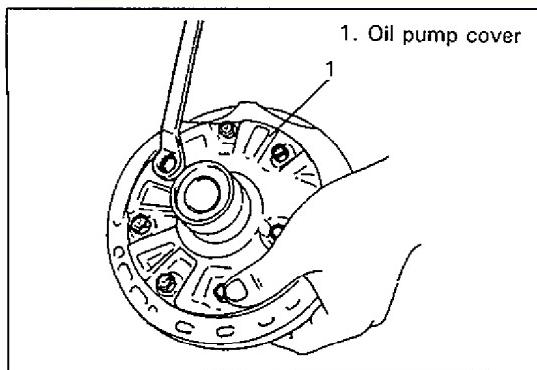
35. Remove oil seal from both sides of transmission case.

DISASSEMBLY OF SUB-ASSEMBLY

OIL PUMP

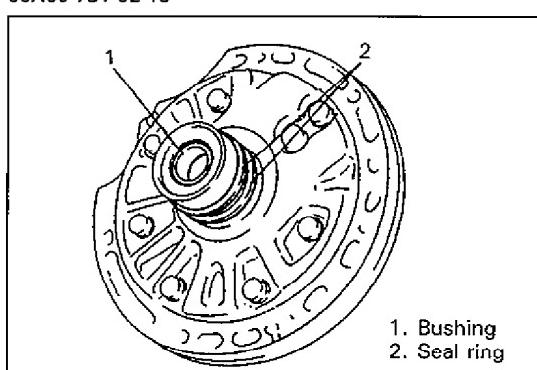


- 1. Oil pump assembly
- 2. Oil pump body oil seal
- 3. Oil pump cover O-ring
- 4. Driven gear
- 5. Drive gear
- 6. Oil pump cover
- 7. Seal ring
- 8. Oil pump body



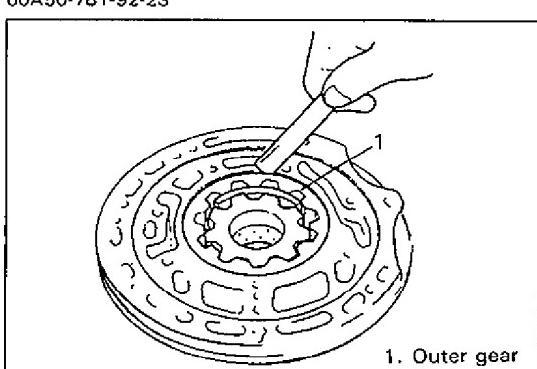
Disassembly

1. Remove 6 bolts, oil pump cover, drive gear and driven gear in that order.
2. Remove oil pump cover O-ring.



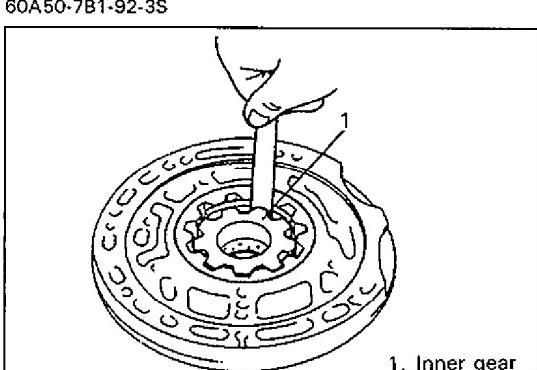
Inspection

Check seal ring and bushing for wear and damage.



Clearance between outer gear and body:

Standard 0.07–0.15 mm (0.0028–0.0059 in)
Service limit 0.30 mm (0.0118 in)

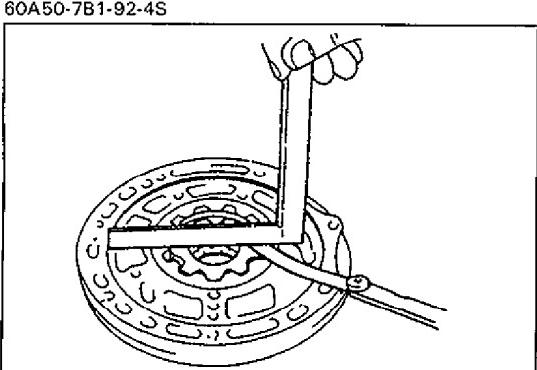


Tip clearance between inner gear and outer gear:

Standard 0.11–0.14 mm (0.0044–0.0055 in)
Service limit 0.30 mm (0.01181 in)

NOTE:

Measure with torque converter installed.



Side clearance between inner gear/outer gear and pump body:

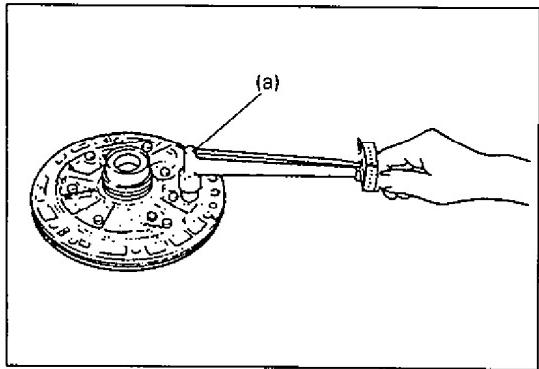
Standard 0.02–0.05 mm (0.0008–0.0019 in)
Service limit 0.1 mm (0.0039 in)

Assembly

Assemble each component by reversing removal procedure and noting following points.

- Before installing inner gear and outer gear to pump body, apply A/T fluid to them.

60A50-7B1-93-1S



60A50-7B1-93-2S

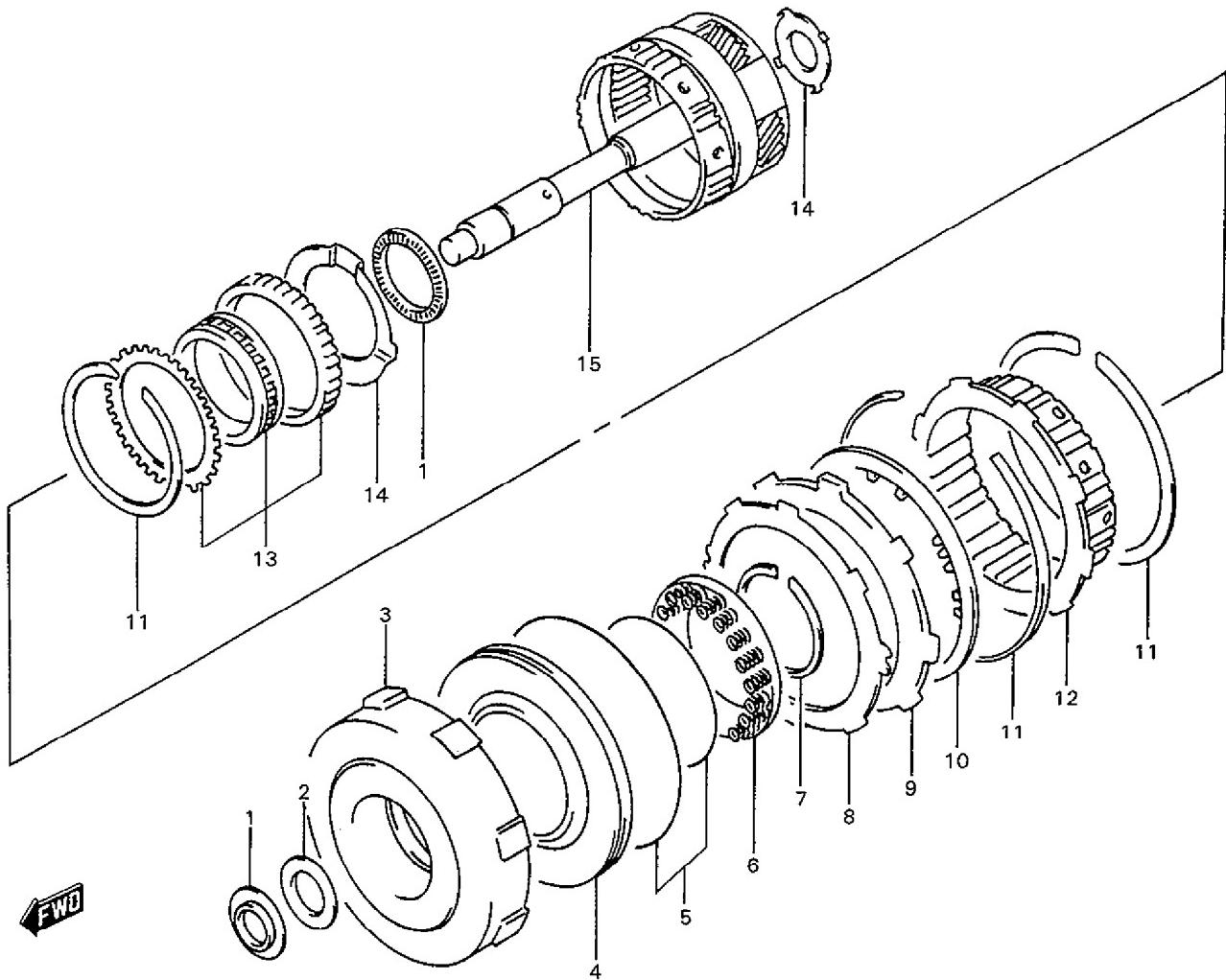
- When installing pump cover, use care so that its splined part will not cause damage to oil seal and use specified torque to tighten it to pump body.

Tightening Torque

(a) : 6–9 N·m (0.6–0.9 kg·m, 4.5–6.5 lb·ft)

- When installing O-ring and oil seal, apply enough A/T fluid to them and fit them securely in groove.
- After installation, check that inner gear turns smoothly by making use of torque converter.
- When installing seal ring, it should not be opened more than necessary.
- Fit claws of seal ring securely.

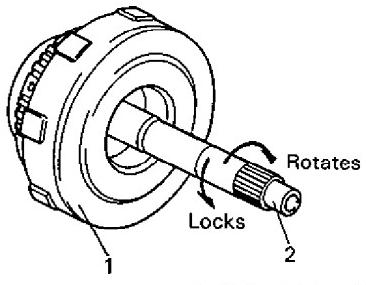
OVERDRIVE (PLANETARY GEAR SIDE)



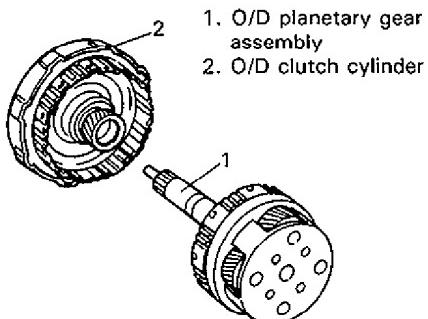
1. Bearing
2. Race
3. Clutch cylinder
4. Clutch piston
5. O-ring
6. Return spring
7. Snap ring
8. Cushion clutch plate
9. Clutch backing plate
10. Clutch disc
11. Retaining ring
12. Brake hub
13. One-way clutch
14. Thrust washer
15. O/D planetary gear

Disassembly

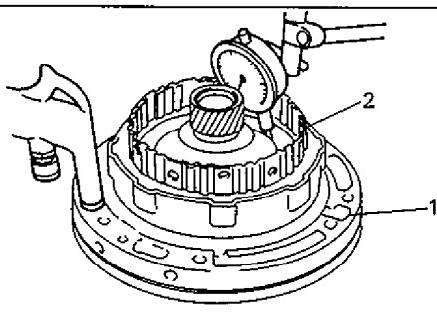
- With overdrive (O/D) clutch cylinder held stationary, turn O/D input shaft clockwise to check that it turns smoothly and then counterclockwise to check that it locks.



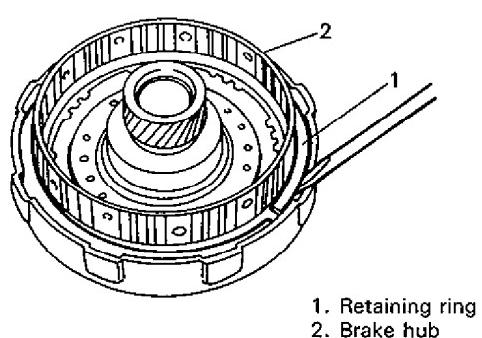
60A50-7B1-95-1S



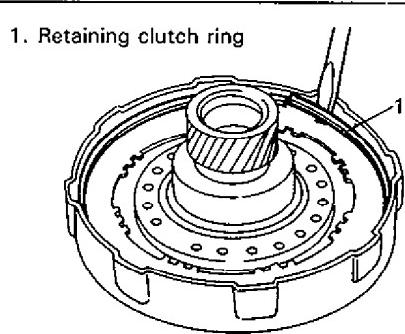
60A50-7B1-95-2S



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60A50-7B1-95-4S



60A50-7B1-95-5S

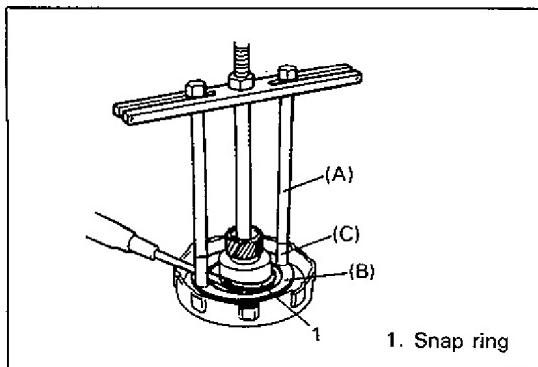
- Remove O/D planetary gear assembly.

- With O/D clutch assembly installed to oil pump, apply 4 to 8 kg/cm² air pressure into fluid hole in oil pump and measure stroke of clutch piston. If it is not within standard range, replace cushion clutch plate or clutch disc.

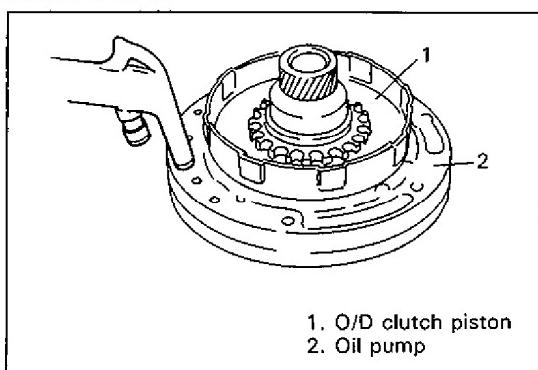
Standard stroke of clutch piston:
1.47 – 2.28 mm (0.058 – 0.089 in)

- Remove retaining ring and then remove brake hub.

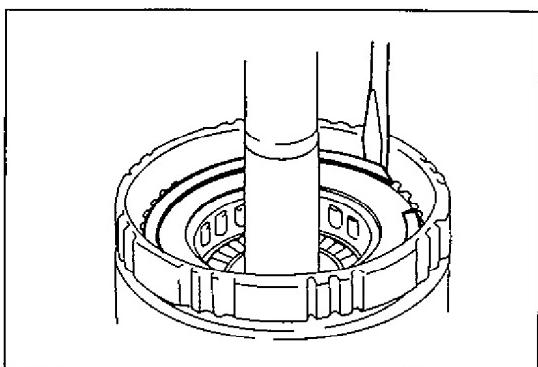
- Remove retaining clutch ring cushion plate, backing plate and clutch disc in that order.



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60A50-7B1-96-2S



60A50-7B1-96-3S

6. With clutch piston return spring compressed with special tools, remove clutch piston return spring.

Special Tools

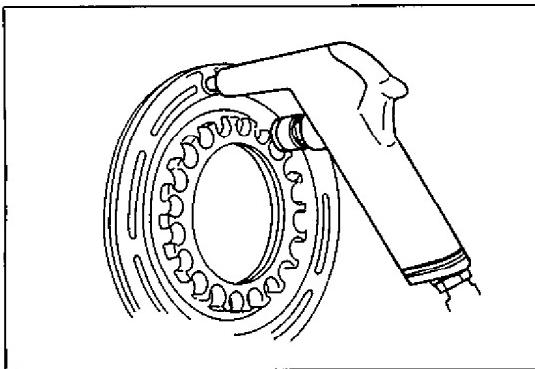
(A): 09918-48211

(B): 09926-98320

(C): 09918-48220

7. Install O/D clutch cylinder to oil pump. Apply compression air into fluid hole in oil pump and remove clutch piston.
8. Remove piston inner O-ring and piston outer O-ring from clutch piston.

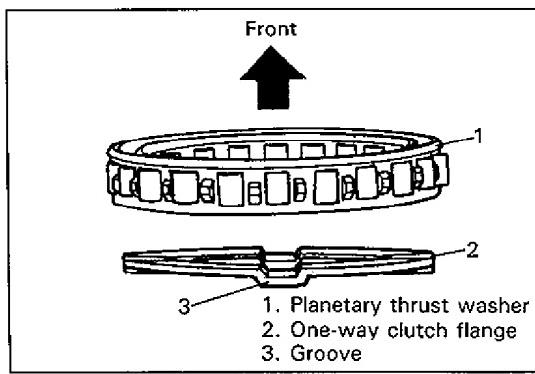
9. Remove retaining ring from O/D planetary gear and then remove one-way clutch, thrust planetary washer and thrust bearing.



60A50-7B1-97-1S

Inspection

- Check that ball valve of clutch piston is not stuck.
- Check valve for leakage by applying low pressure air into ball valve hole.

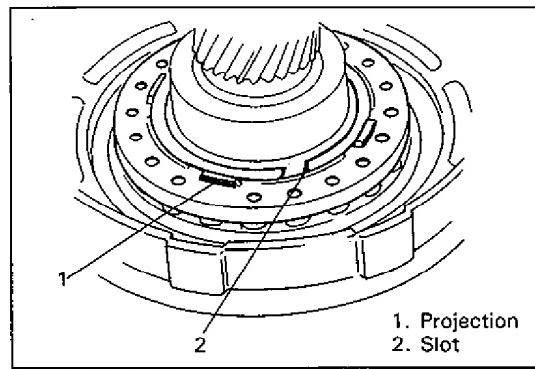


60A50-7B1-97-2S

Assembly

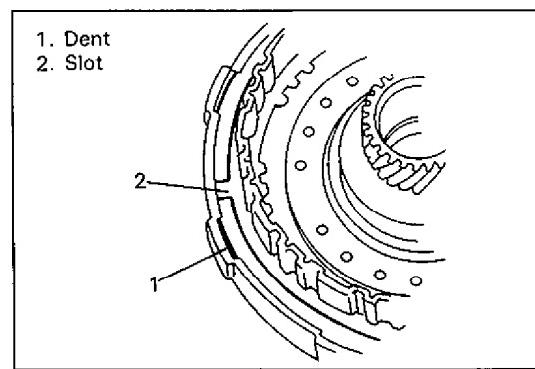
Assemble each component by reversing removal procedure and noting following points.

- When installing thrust washer, bring its oil groove to the front.
- When installing one-way clutch to one-way clutch outer race, bring its flange to the front.



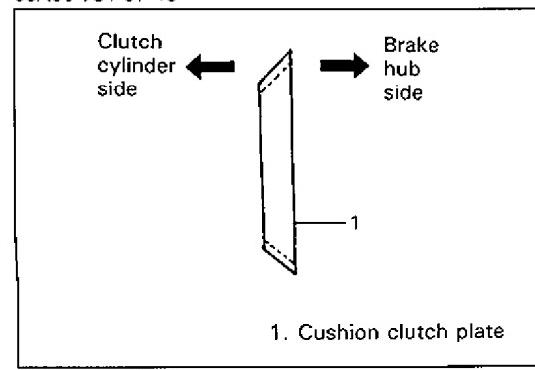
60A50-7B1-97-3S

- Before installing piston inner O-ring and piston outer O-ring, apply A/T fluid to them.
- Install so that snap opening and projection of clutch piston return spring will not match.



60A50-7B1-97-4S

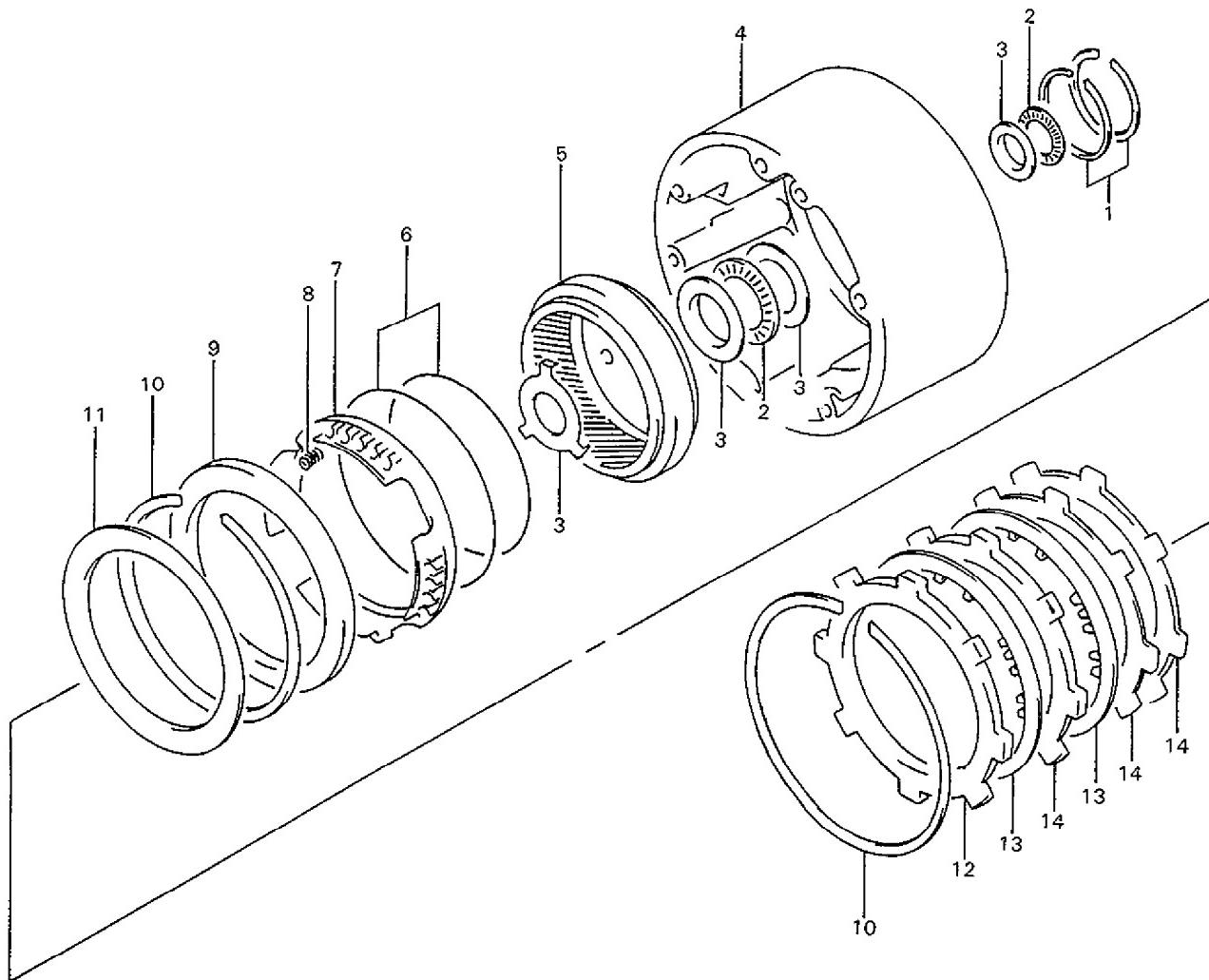
- Install retaining clutch ring and retaining brake hub so that their slots will not match with dent in O/D clutch cylinder.



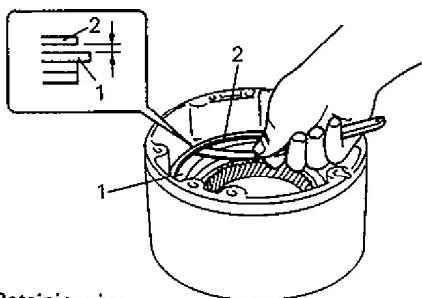
60A50-7B1-97-5S

- For installing cushion clutch plate, refer to left figure.

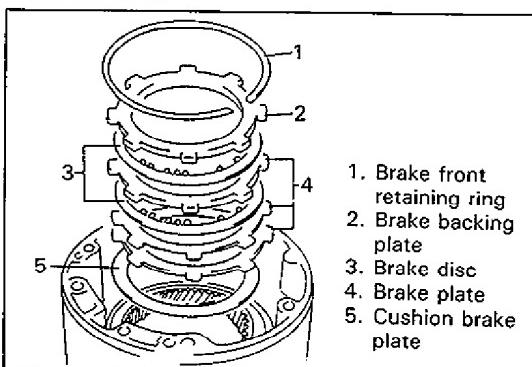
OVERDRIVE (CASE SIDE)



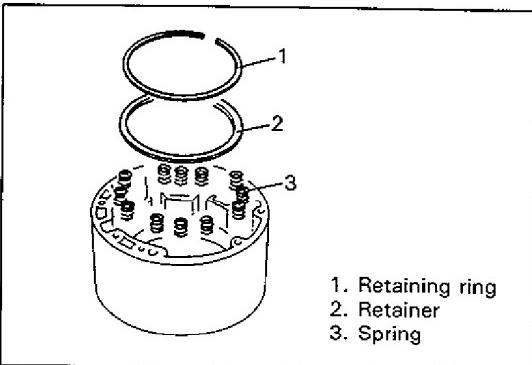
- 1. Sealing
- 2. Bearing
- 3. Bearing race
- 4. O/D case
- 5. Planetary ring gear
- 6. O-ring
- 7. Brake piston
- 8. Return spring
- 9. Retainer
- 10. Retaining ring
- 11. Cushion plate
- 12. Brake backing plate
- 13. Brake disc
- 14. Brake plate



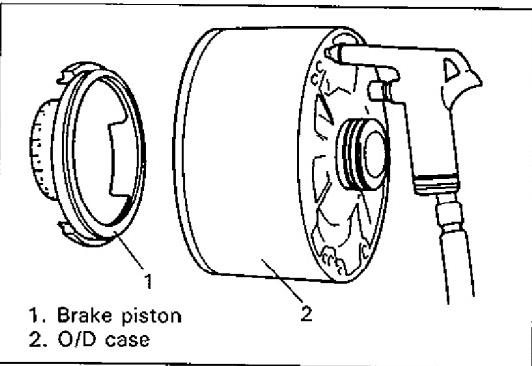
60A50-7B1-99-1S



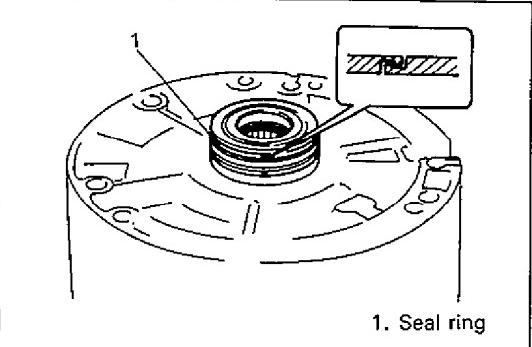
60A50-7B1-99-2S



60A50-7B1-99-3S



60A50-7B1-99-4S



Disassembly

- Measure clearance between retaining ring and brake backing plate with thickness gauge.

Standard clearance: 0.35–1.91 mm (0.014–0.075 in)

If it is not within standard range, replace brake disc or brake plate.

- Remove retaining ring, brake backing plate, brake discs, brake plates, cushion brake plate in that order. Then remove planetary ring gear, thrust bearing race and thrust rear bearing.

- Remove retaining ring, retainer and piston return spring.

- Blow air into fluid hole in O/D case and remove brake piston.

- Remove brake piston inner ring and brake piston outer ring from brake piston.

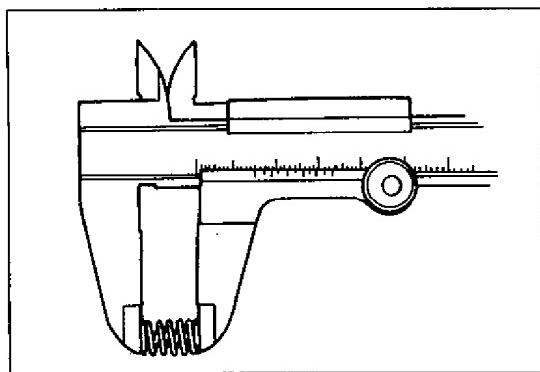
- Unsnap seal ring.

- Remove 2 seal rings.

NOTE:

Be careful not to open seal ring more than necessary.

60A50-7B1-99-5S

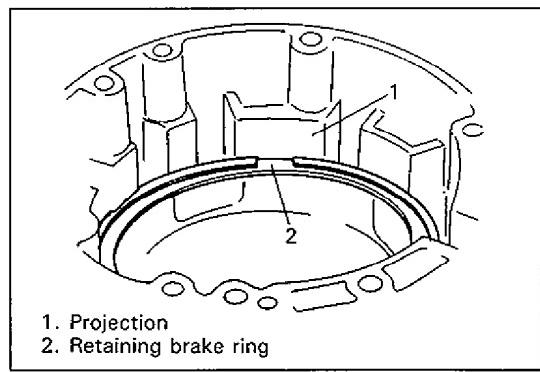


60A50-7B1-100-1S

Inspection

- Measure free length of piston return spring.

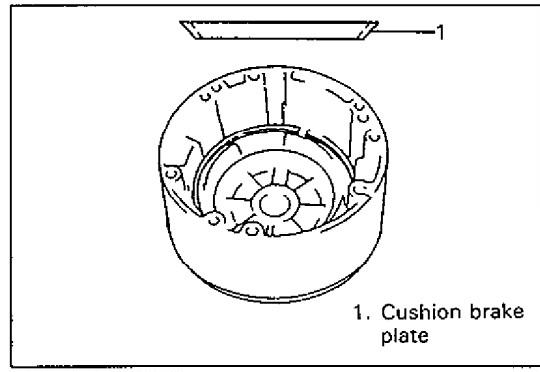
Standard free length: 15.10 mm (0.594 in)



60A50-7B1-100-2S

Assembly

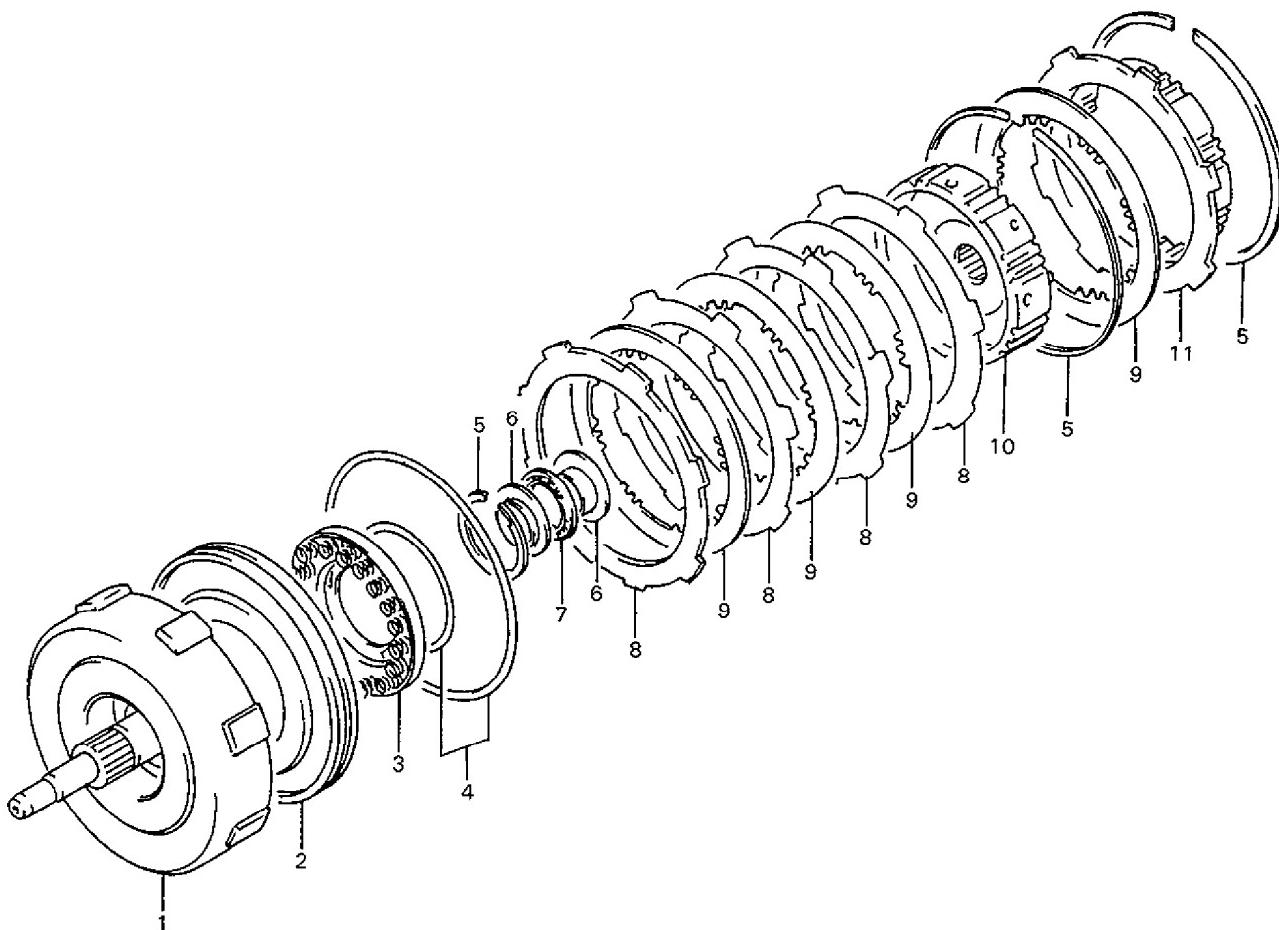
- Install each component by reversing removal procedure and noting following points.
- When installing rear seal ring, use care not to open it too wide.
- Apply A/T fluid to O-ring, disc, etc. before installing them.
- Opening of retaining brake front ring and projection of O/D case should be matched.



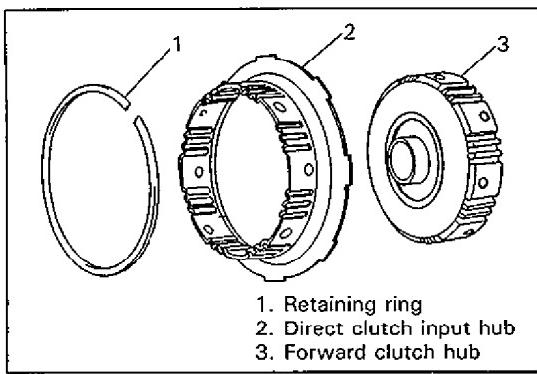
60A50-7B1-100-3S

- Install cushion brake plate so that it warps convexly.
- As a final step, measure clearance between retaining brake front ring and brake backing plate again.

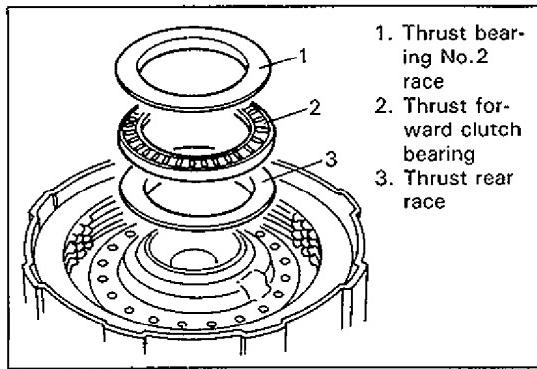
Standard clearance: 0.35–1.91 mm (0.014–0.075 in)

FORWARD CLUTCH

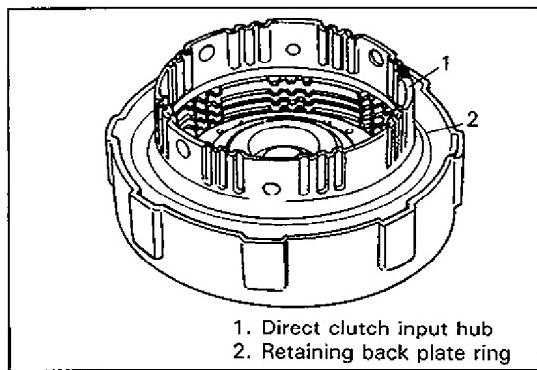
1. Input shaft
2. Piston
3. Return spring
4. O-ring
5. Retaining ring
6. Bearing race
7. Bearing
8. Clutch plate
9. Clutch disc
10. Forward clutch hub
11. Direct clutch input hub



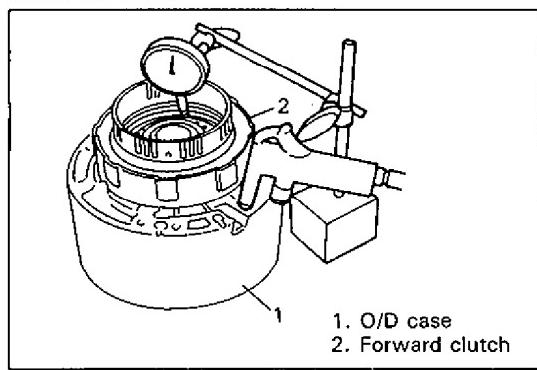
60A50-7B1-102-1S



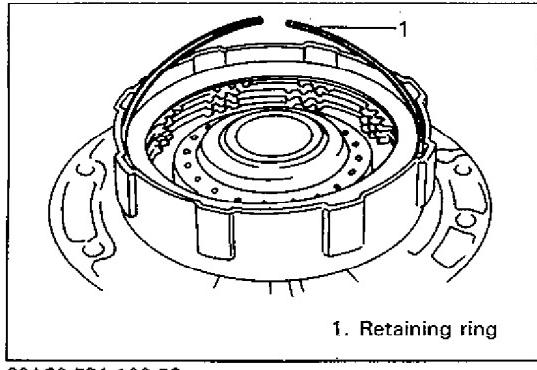
60A50-7B1-102-2S



60A50-7B1-102-3S



60A50-7B1-102-4S



Disassembly

1. After removing retaining ring, remove direct clutch input hub and forward clutch hub.

2. Remove bearing race and thrust bearing.

3. Install direct clutch input hub and retaining ring.

4. Install forward clutch to O/D case. Apply 4–8 kg/cm² air pressure into fluid hole at the right of cut in O/D case and measure movement of forward clutch piston.

Standard forward clutch piston movement:

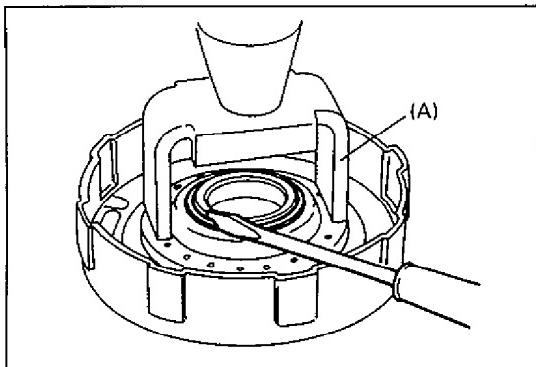
1.40–2.24 mm (0.056–0.088 in)

If measured value is not within standard range, use either 1.8 mm (0.071 in) or 2.0 mm (0.079 in) clutch disc to adjust it to standard value.

5. Remove retaining ring and then remove direct clutch input hub.

6. Remove retaining ring and then remove all clutch discs.

60A50-7B1-102-5S



60A50-7B1-103-1S

7. Using special tool and hydraulic press, compress forward clutch piston return spring and remove retaining return spring.

Special Tool

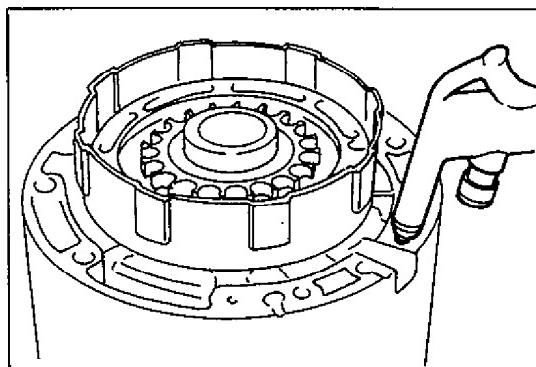
(A): 09926-98310

CAUTION:

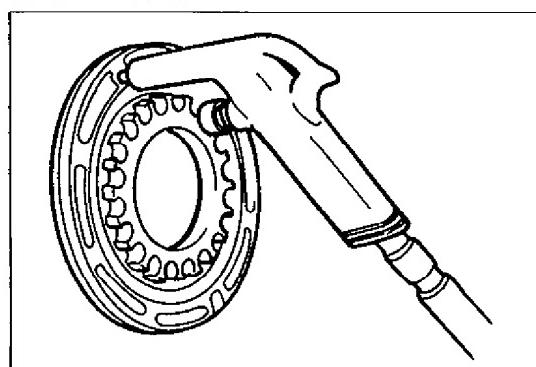
Be careful when applying pressure, for overpressure will cause plate section of piston return spring to deform.

8. Remove forward clutch piston return spring.

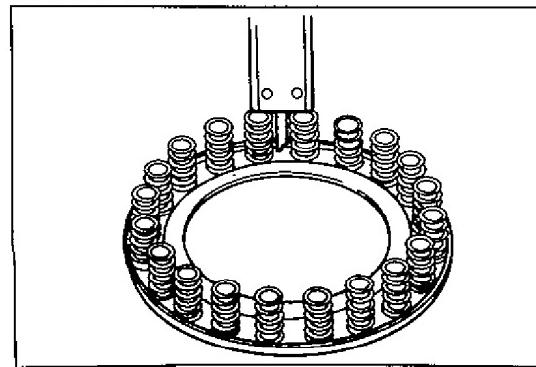
60A50-7B1-103-2S



60A50-7B1-103-3S



60A50-7B1-103-4S



9. Install forward clutch to O/D case. Blow low pressure air into fluid hole at the right of cut in O/D case to remove forward clutch piston.

Inspection**Forward clutch piston**

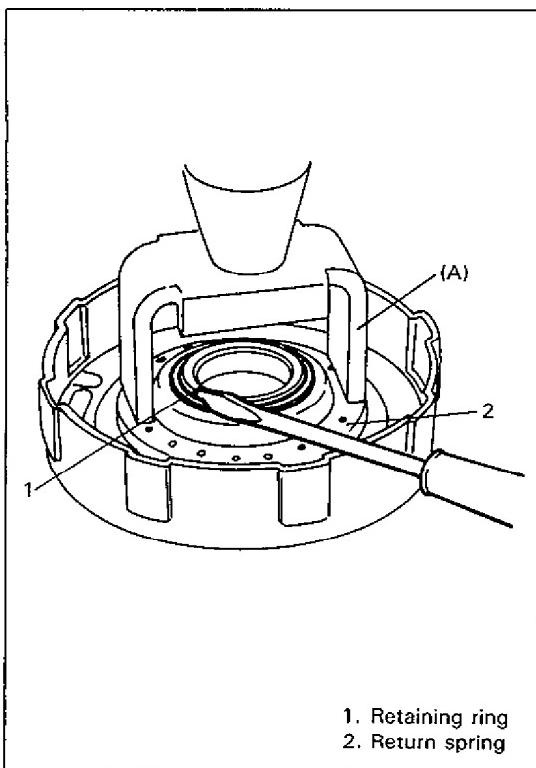
- Shake piston to check that ball is not stuck.
- Blow low pressure air to check ball section for leakage.

Forward clutch piston return spring

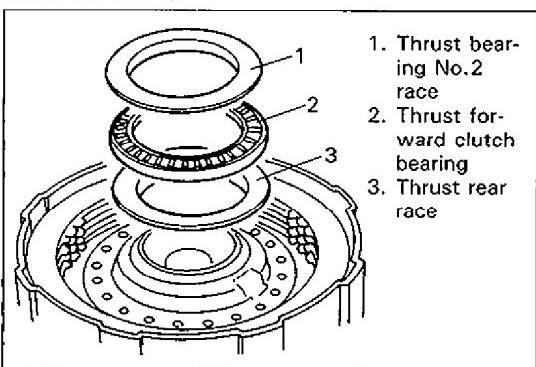
- Measure free length.

Standard free length: 15.10 mm (0.594 in)

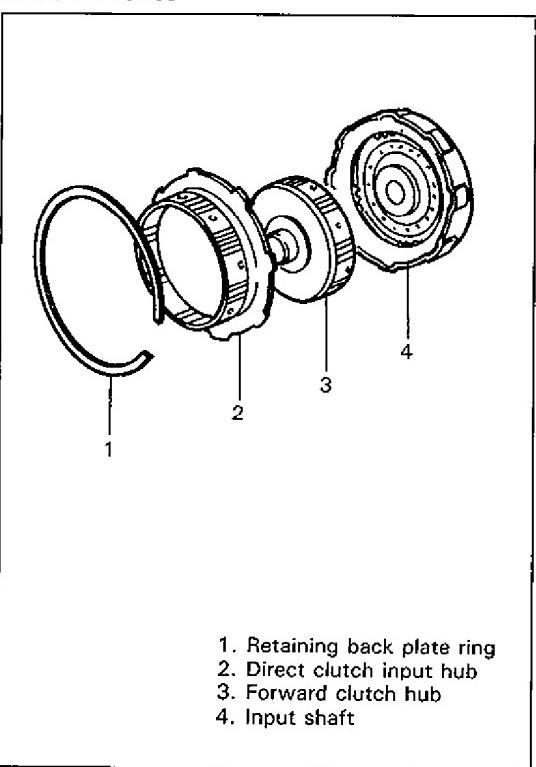
60A50-7B1-103-5S



60A50-7B1-104-1S



60A50-7B1-104-3S



60A50-7B1-104-4S

Installation

1. Apply A/T fluid to forward input shaft O-rings, install forward clutch piston and piston return spring to forward input shaft and then install return spring ring with special tool and hydraulic press.

Special Tool

(A): 09926-98310

NOTE:

- When installing return spring, be careful so that return spring will not fall or tilt.
- Do not align opening in retaining ring with lug of forward clutch piston return spring at its retainer section.

CAUTION:

Be careful when applying pressure, for overpressure will cause plate section of piston return spring to deform.

2. Install clutch discs from the thinnest one to thicker ones to piston side and then install retaining clutch ring.

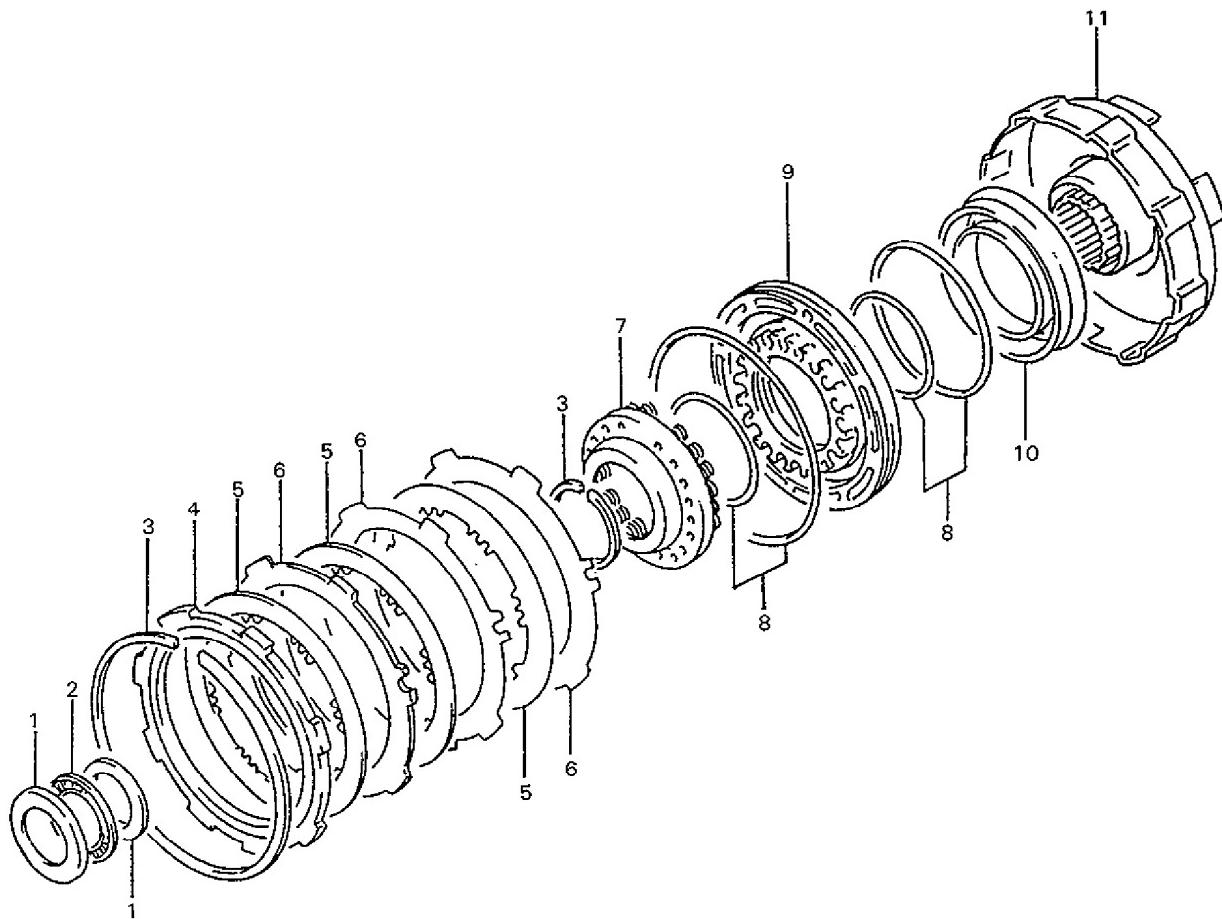
NOTE:

Do not match opening in retaining clutch ring and dent in forward clutch input shaft.

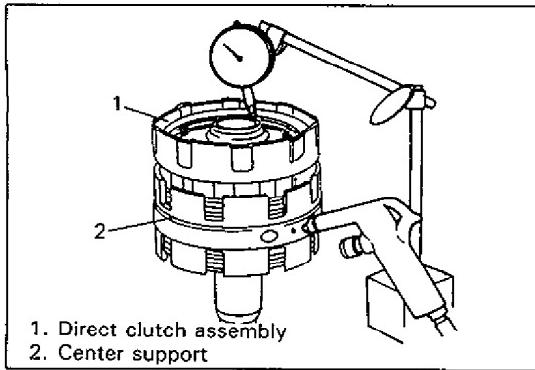
3. Install bearing races and thrust bearing.

4. Install forward clutch hub, direct clutch hub and retaining ring in that order.

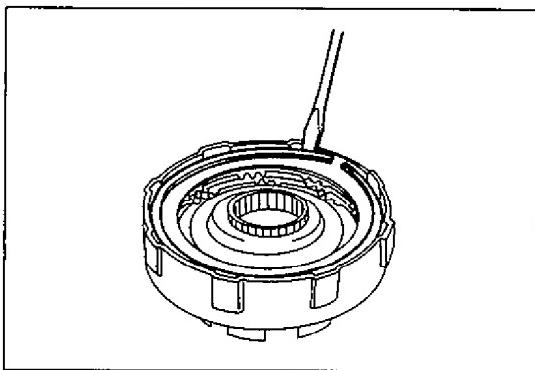
DIRECT CLUTCH



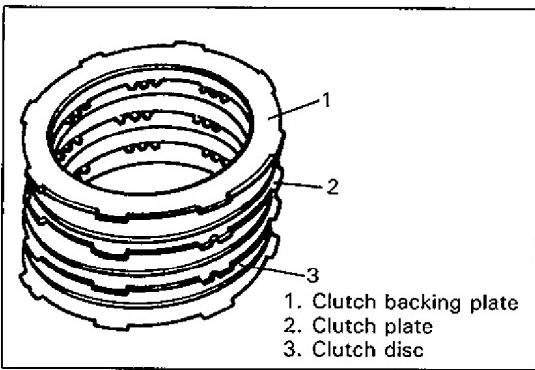
1. Bearing race
2. Bearing
3. Retaining ring
4. Clutch backing plate
5. Clutch disc
6. Clutch plate
7. Return spring
8. O-ring
9. Direct clutch piston
10. Direct clutch inner piston
11. Direct clutch cylinder



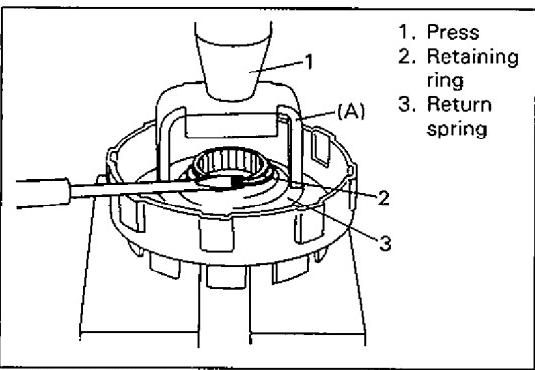
60A50-7B1-106-1S



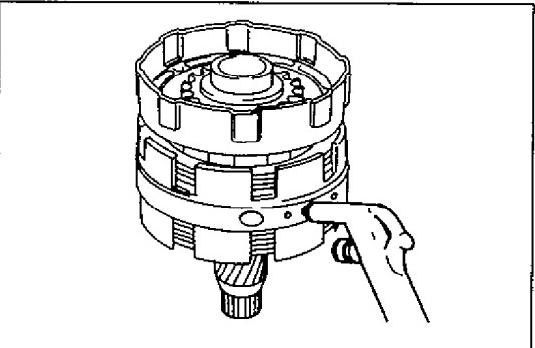
60A50-7B1-106-2S



60A50-7B1-106-3S



60A50-7B1-106-4S



60A50-7B1-106-5S

Disassembly

1. Install direct clutch assembly to center support and with 4–8 kg/cm² air pressure applied to second fluid hole from the left, measure stroke of direct clutch piston as shown in figure.

Standard direct clutch piston stroke:

0.19–1.75 mm (0.008–0.068 in)

If it is not within standard range, use 3.6 mm, 3.8 mm or 4.0 mm (0.141 in, 0.149 in or 0.157 in) clutch backing plate to adjust it to standard stroke.

2. Remove direct clutch assembly from center support and then remove retaining ring.

3. Remove clutch backing plate and then remove clutch discs and clutch plates.

4. Using special tool and hydraulic press, compress direct clutch piston return spring and remove retaining return spring ring.

Special Tool

(A): 09926-98310

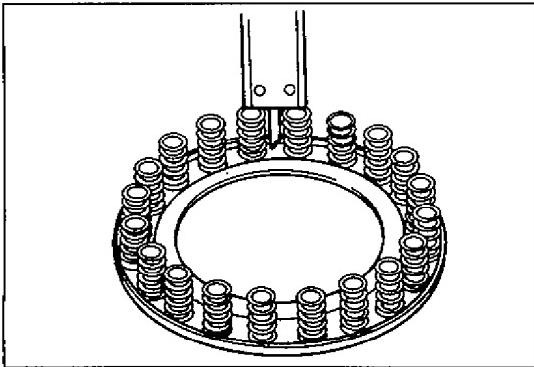
CAUTION:

Be careful when applying pressure, for overpressure will cause plate section of piston return spring to deform.

5. Remove direct clutch piston return spring.

6. Install direct clutch cylinder to center support.

Remove direct clutch piston by blowing air into the second hole from the left as shown in figure. Also, remove direct clutch inner piston by blowing air into hole at the extreme right. And then remove O-rings from pistons.

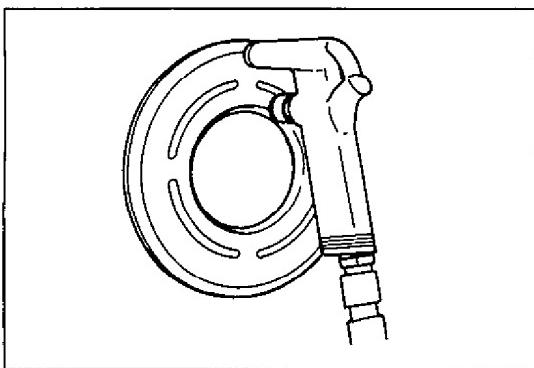


60A50-7B1-107-1S

Inspection**Direct clutch piston return spring**

- Measure free length.

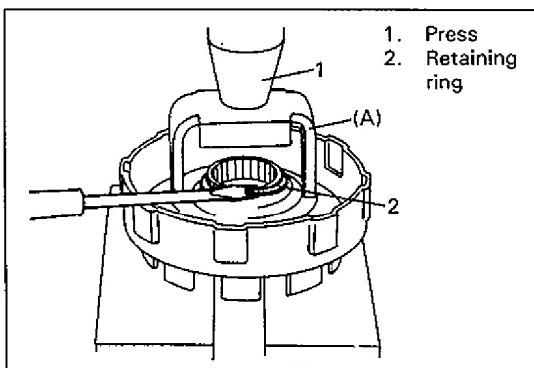
Standard free length of direct clutch piston return spring:
15.13 mm (0.595 in)



60A50-7B1-107-2S

Direct clutch piston

- Shake piston to check that ball is not stuck.
- Apply air pressure and check that there is no leakage.



60A50-7B1-107-3S

Assembly

Assemble each component by reversing disassembly procedure and noting following points.

- Always use new O-ring and apply A/T fluid before installation.
- Do not align opening in retaining ring with lug of direct clutch piston return spring at retainer.

Special Tool

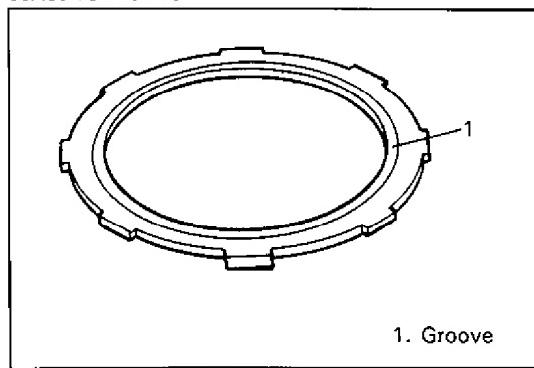
(A): 09926-98310

- Use care so that direct clutch piston return spring will not fall or tilt.

CAUTION:

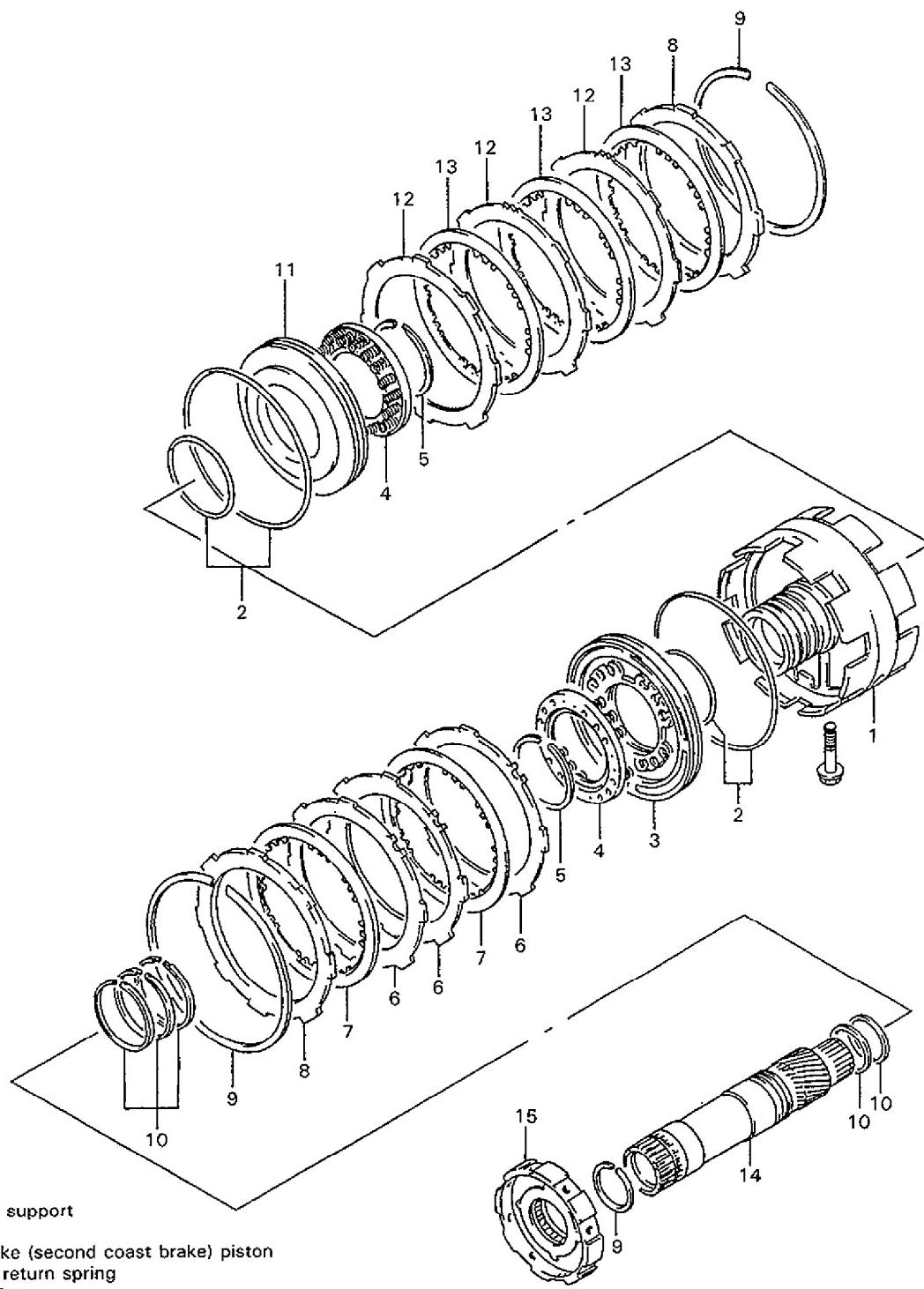
Be careful when applying pressure, for overpressure will cause plate section of piston return spring to deform.

- Do not match opening in retaining back plate ring with cutout in direct clutch cylinder
- Install clutch backing plate with its grooved side facing the front.

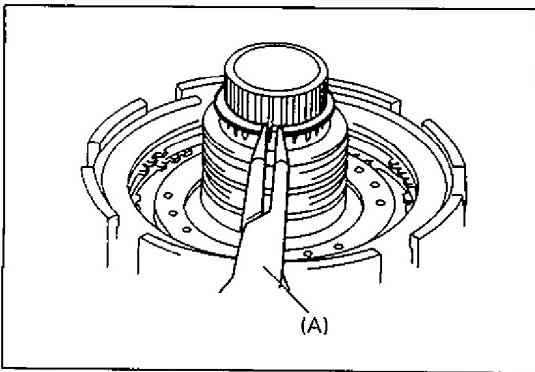


60A50-7B1-107-5S

CENTER SUPPORT



1. Center support
2. O-ring
3. B1 brake (second coast brake) piston
4. Piston return spring
5. Snap ring
6. B1 brake plate
7. B1 brake disc
8. Clutch backing plate
9. Retaining ring
10. Seal ring
11. B2 (Second brake) brake piston
12. B2 brake plate
13. B2 brake disc
14. Planetary sun gear
15. B2 brake hub assembly



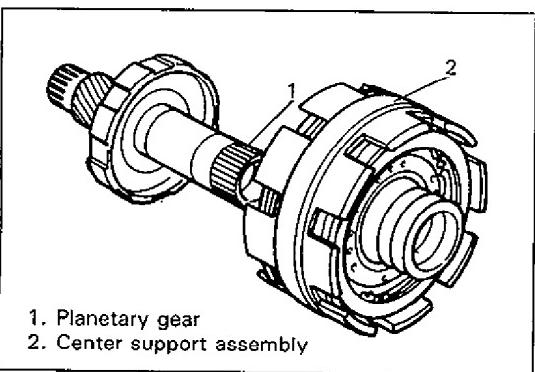
60A50-7B1-109-1S

Disassembly

1. Remove retaining ring.

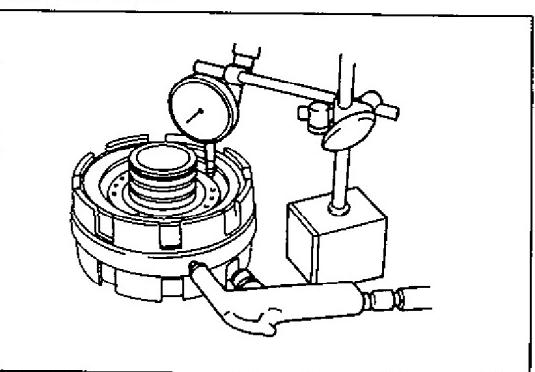
Special Tool

(A): 09920-76010



60A50-7B1-109-2S

2. Pull out center support assembly from planetary sun gear.



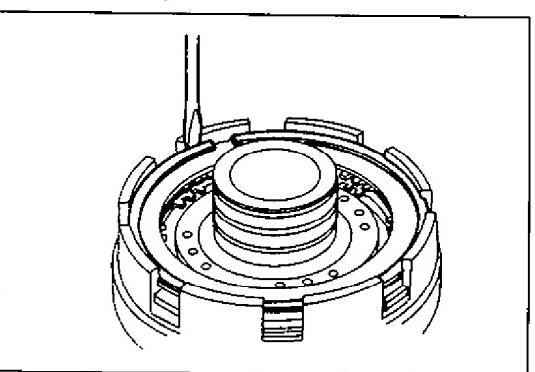
60A50-7B1-109-3S

3. Apply 4–8 kg/cm² air pressure into fluid hole at the extreme left and measure movement of B1 brake (Second coast brake) piston.

Standard B1 brake piston movement:

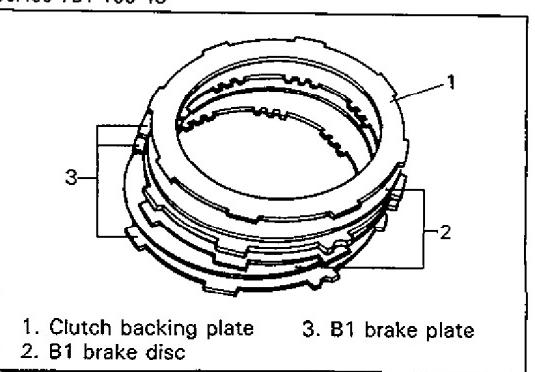
0.63–1.73 mm (0.025–0.068 in)

If measured value is not within standard range, replace B1 brake plate or B1 brake disc.



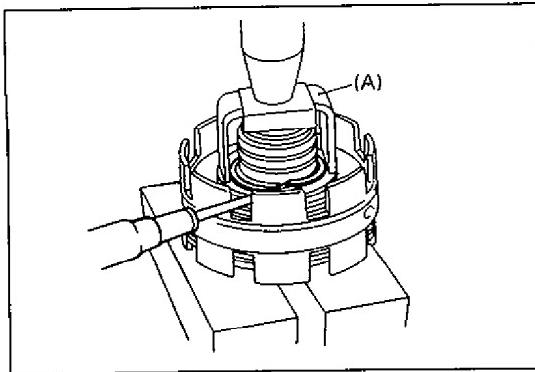
60A50-7B1-109-4S

4. Remove retaining ring.



60A50-7B1-109-5S

5. After removing clutch backing plate, remove B1 brake plates and B1 brake discs.



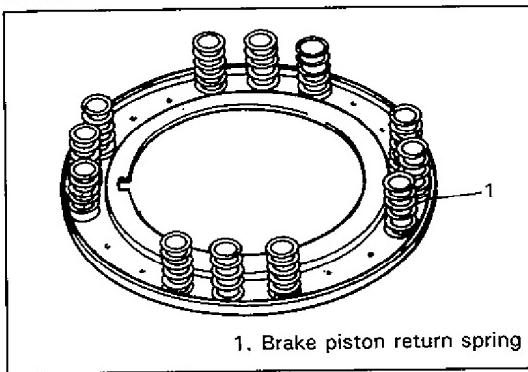
60A50-7B1-110-1S

- Using special tool and hydraulic press, compress piston return spring and remove snap ring.

CAUTION:

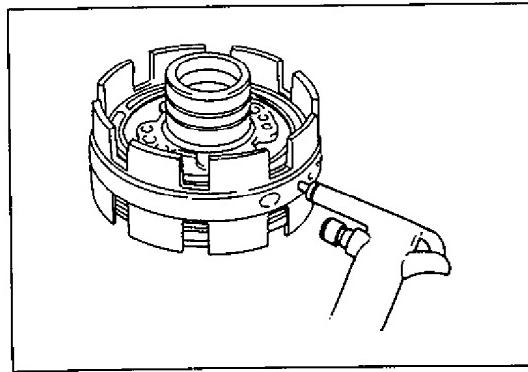
Be careful when applying pressure, for overpressure will cause plate section of brake piston return spring to deform.

Special Tool
(A): 09926-98310



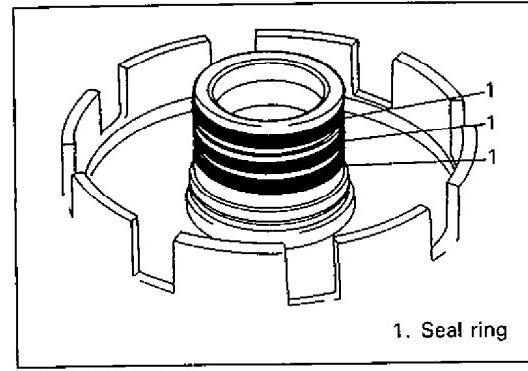
60A50-7B1-110-2S

- Remove brake piston return spring.



60A50-7B1-110-3S

- Blow air into fluid hole at the extreme left and remove B1 brake piston as shown in figure. Then remove piston inner O-ring and piston outer O-ring from B1 brake piston.

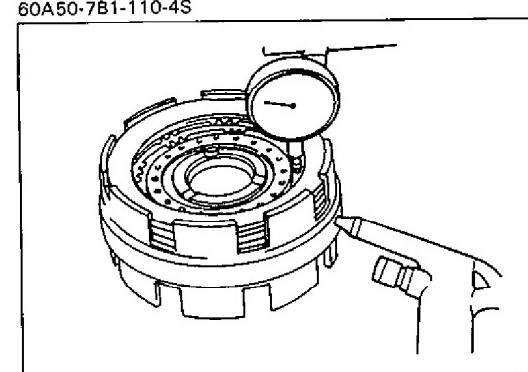


60A50-7B1-110-4S

- Remove 3 seal rear rings.

NOTE:

Use care not to open ring more than necessary.

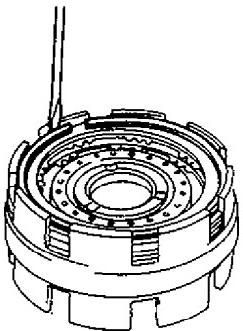


60A50-7B1-110-5S

- Apply 4–8 kg/cm² air pressure into the second hole from the left and measure stroke of B2 brake (Second brake) piston as shown in figure.

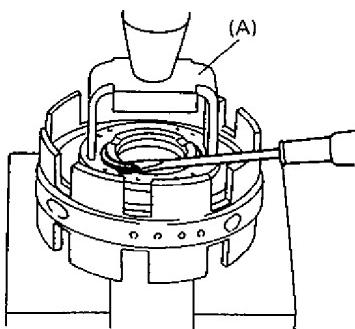
Standard B2 brake piston stroke:
1.01–2.25 mm (0.040–0.088 in)

If measured value is not within standard range, replace B2 brake plates or B2 brake discs.



60A50-7B1-111-1S

11. After removing retaining back plate ring, remove clutch backing plate, B2 brake plates, and B2 brake discs.



60A50-7B1-111-2S

12. Using special tool and hydraulic press, compress brake piston return spring and remove snap B1 brake ring.

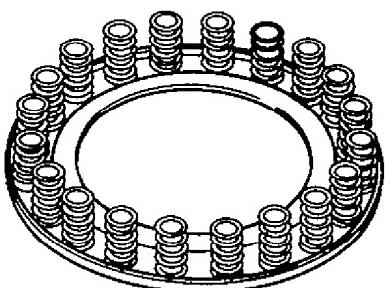
CAUTION:

Be careful when applying pressure, for overpressure will cause plate section of brake piston return spring to deform.

Special Tool

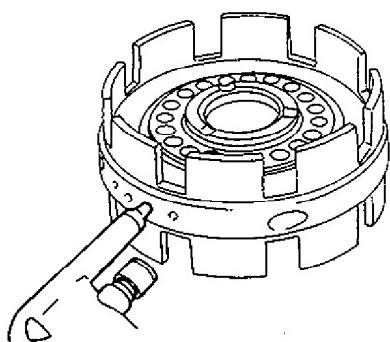
(A): 09926-98310

13. Remove brake piston return spring.



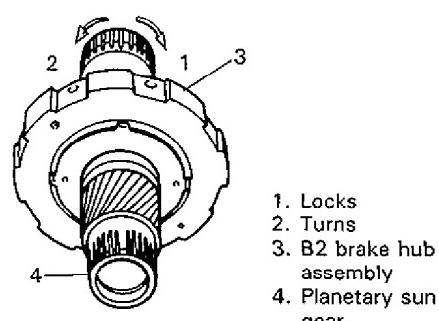
60A50-7B1-111-3S

14. Blow air into the second air hole from the left and remove B2 brake piston. Then remove piston inner O-ring and piston outer O-ring from B2 brake piston.



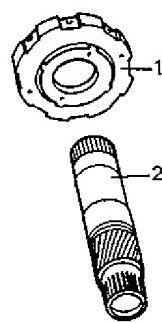
60A50-7B1-111-4S

15. With B2 brake hub assembly held stationary, turn planetary sun gear clockwise to check that it locks and then counterclockwise to check that it turns smoothly.



- 1. Locks
- 2. Turns
- 3. B2 brake hub assembly
- 4. Planetary sun gear

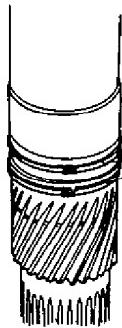
60A50-7B1-111-5S



1. Brake hub
2. Planetary sun gear

60A50-7B1-112-1S

16. Remove B2 brake hub assembly from planetary sun gear.



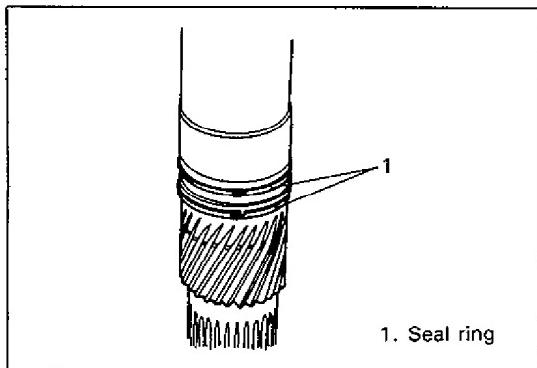
1. Seal ring

60A50-7B1-112-2S

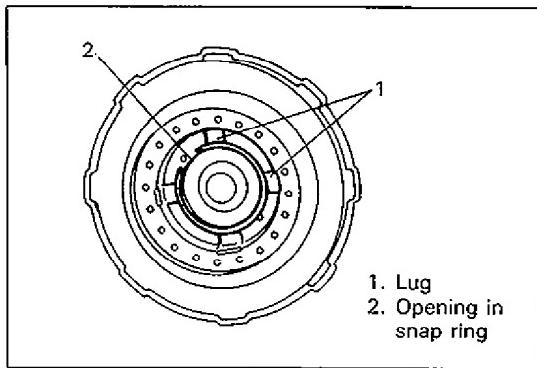
17. Remove 2 sun gear seal rings from planetary sun gear.

NOTE:

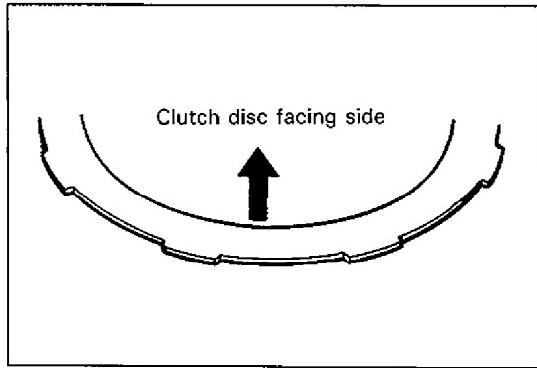
Use care not to open sun gear seal ring more than necessary.



60A50-7B1-113-1S



60A50-7B1-113-2S



60A50-7B1-113-3S

Assembly

Assemble components by reversing disassembly procedure and noting following points.

- Snap both ends of sun gear seal ring securely.
- Do not open sun gear seal ring more than necessary.
- Always use new O-ring and apply A/T fluid before installation.
- When installing O-ring, make sure that it is not kinked or caught.
- Push in brake piston horizontally
- When installing brake piston return spring, be careful so that spring will not fall or tilt.
- When installing snap ring, do not align lug of retainer with opening in snap ring.

- Install clutch backing plate with its chamfered side facing brake disc.

- After installing each retaining backing plate ring, measure movement of brake piston again.

Standard movement of B1 brake piston:

0.63–1.73 mm (0.025–0.068 in)

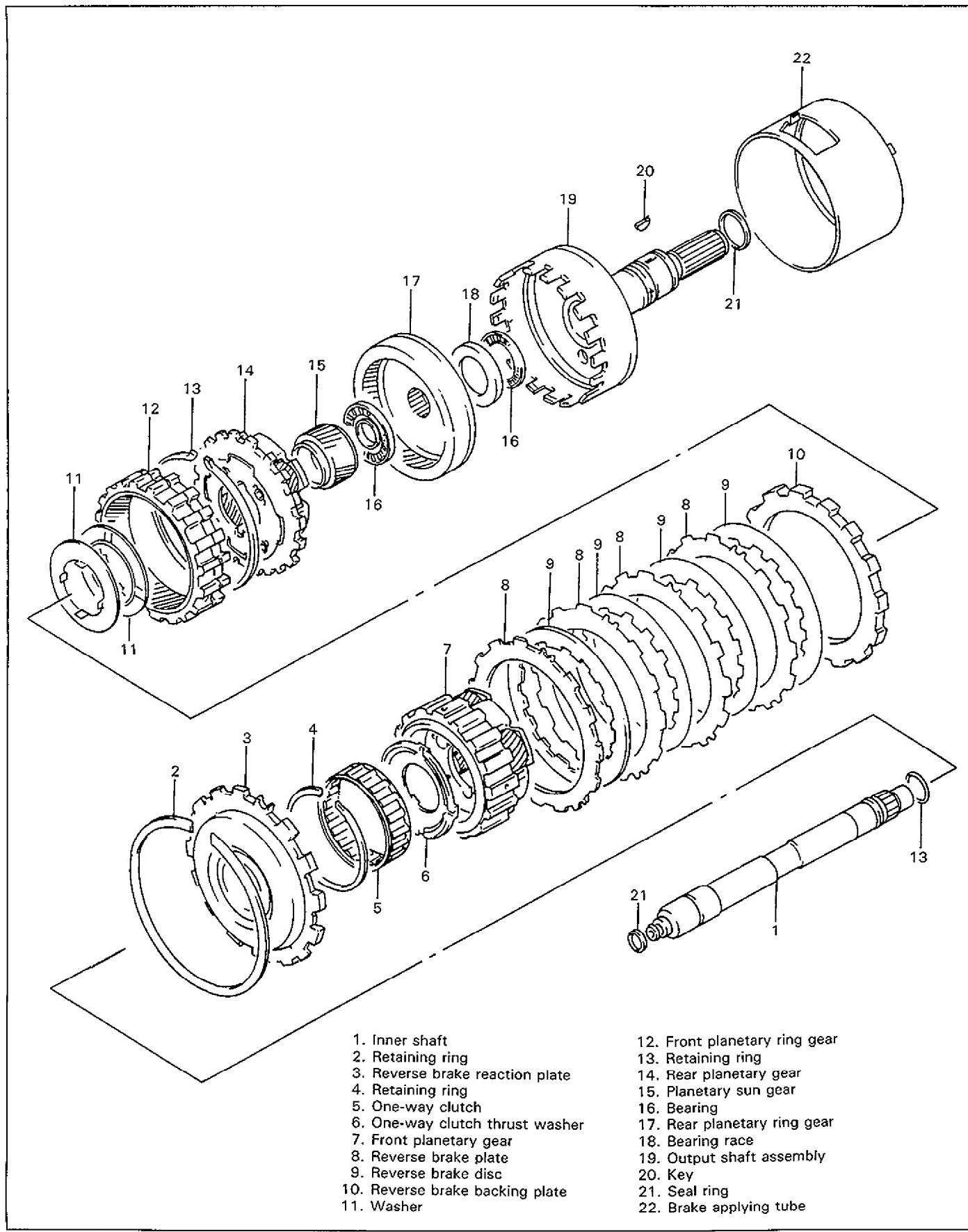
Standard movement of B2 brake piston:

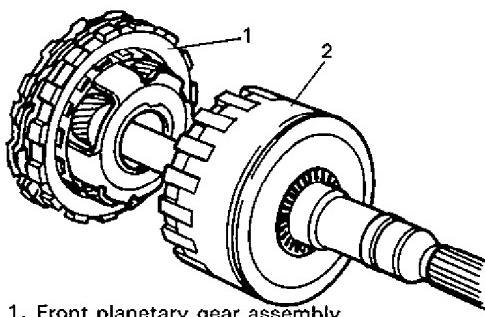
1.01–2.25 mm (0.040–0.088 in)

If it is not within standard range, it is possible that ring is not installed properly. Then disassemble and reassemble again.

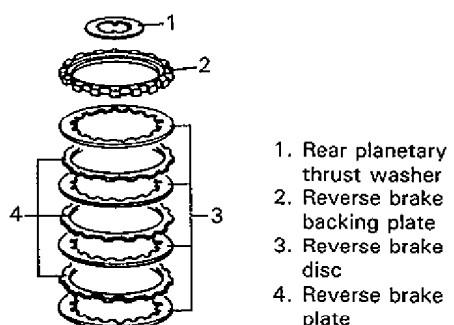
60A50-7B1-113-4S

PLANETARY GEARS, OUTPUT SHAFT



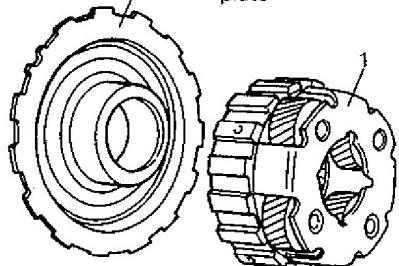


60A50-7B1-115-1S

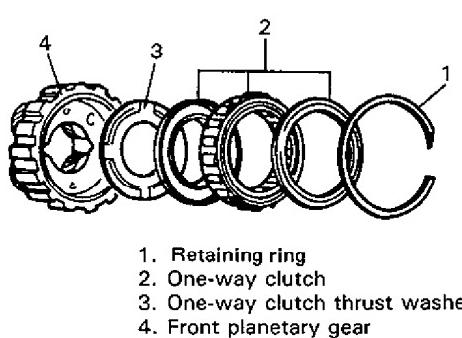


60A50-7B1-115-2S

1. Front planetary gear
2. Reverse brake reaction plate

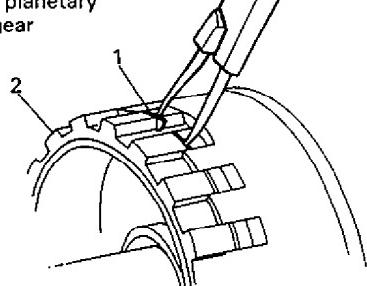


60A50-7B1-115-3S



60A50-7B1-115-4S

1. Retaining ring
2. Front planetary ring gear



60A50-7B1-115-5S

Disassembly

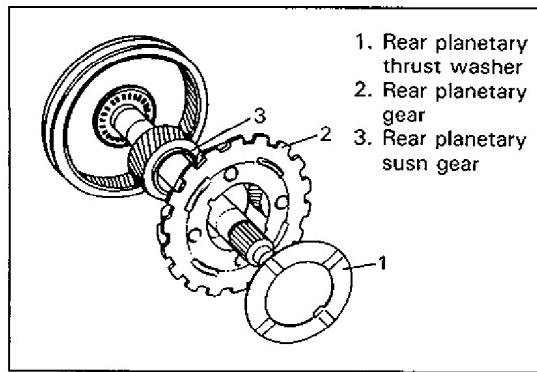
1. Remove front planetary gear assembly from output shaft assembly.

2. Remove rear planetary thrust washer, reverse brake backing plate, reverse brake discs and reverse brake plates from front planetary gear assembly.

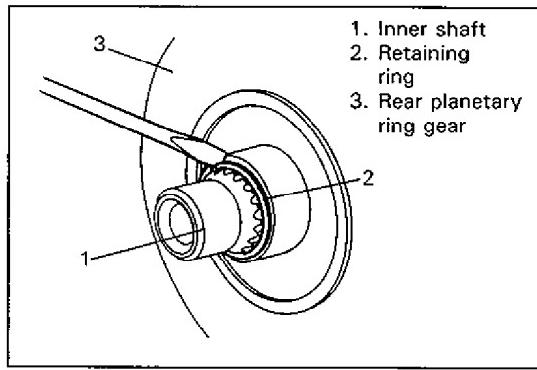
3. Remove reverse brake reaction plate from front planetary gear.

4. After removing retaining ring, remove one-way clutch and one-way clutch rear thrust washer.

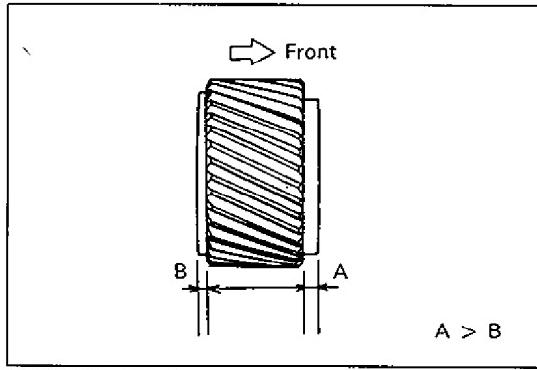
5. After removing retaining ring, remove front planetary ring gear, thrust bearing and rear planetary race.



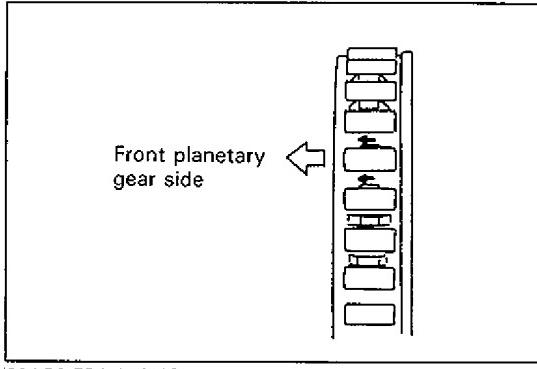
60A50-7B1-116-1S



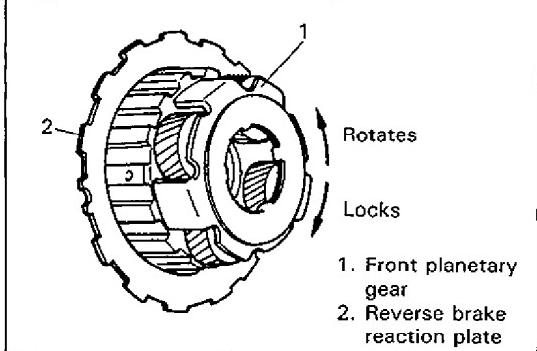
60A50-7B1-116-2S



60A50-7B1-116-3S



60A50-7B1-116-4S



60A50-7B1-116-5S

- Remove rear planetary thrust washer, rear planetary gear and rear planetary sun gear.

- After removing retaining ring from inner shaft, remove rear planetary ring gear and thrust bearing assembly.

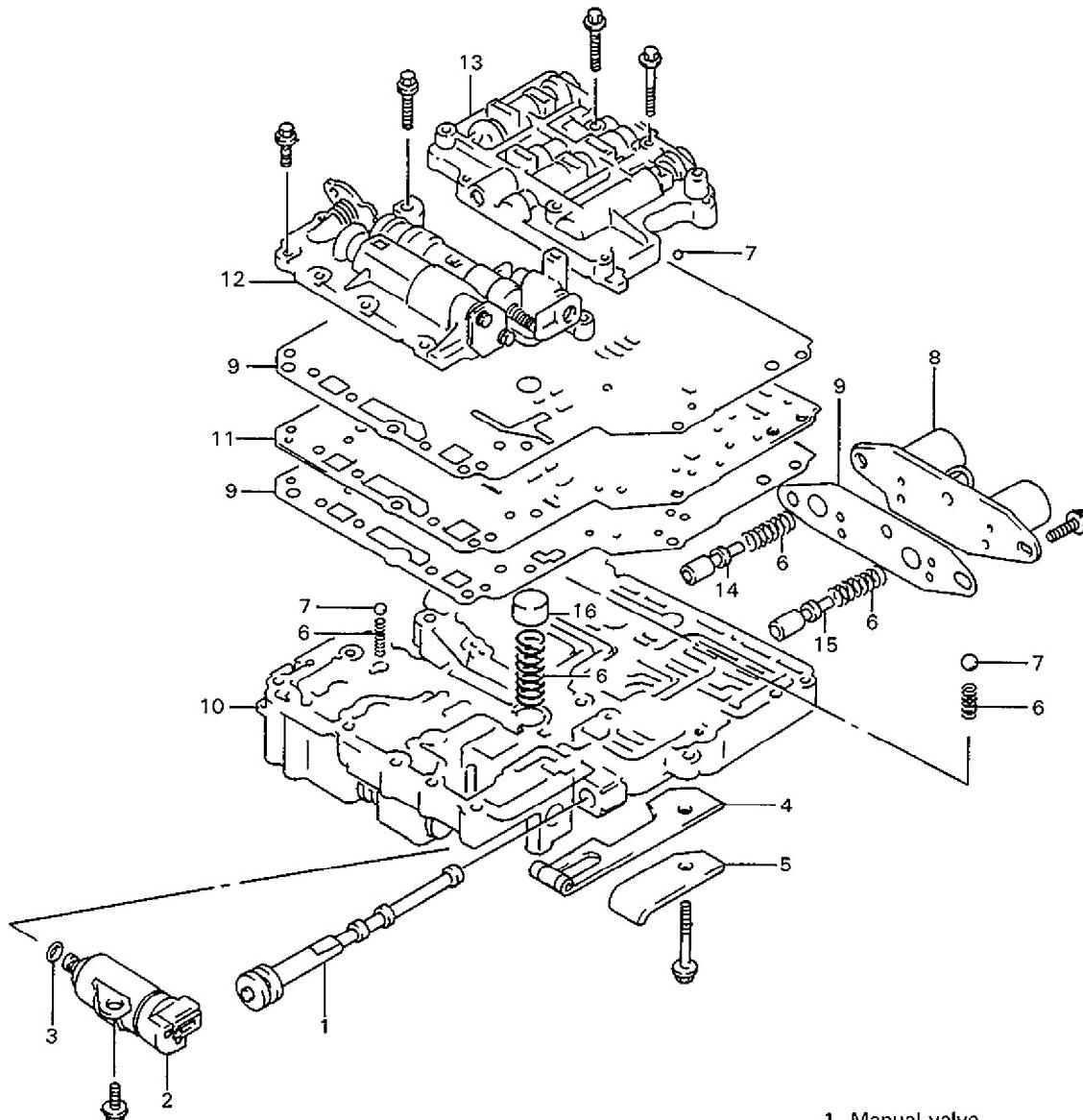
Assembly

Assemble components by reversing disassembly procedure and noting following points.

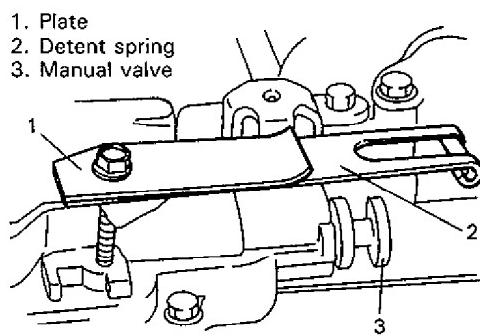
- Check seal sleeve ring for damage before installation and replace if damaged.
- Install planetary sun gear as shown in figure.
- Fit retaining rings into groove securely.

- Install one-way clutch as shown in figure.

- Install reverse brake reaction plate to front planetary gear. With reverse brake reaction plate fixed stationary, turn front planetary gear clockwise to check that it locks and then counterclockwise to check that it turns smoothly.

VALVE BODY ASSEMBLY

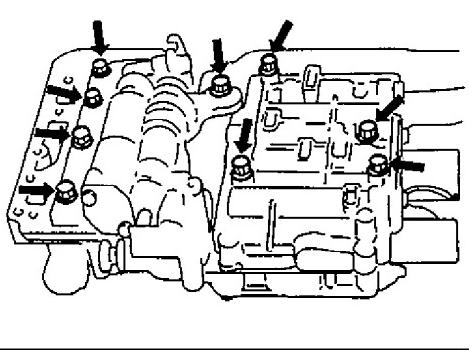
1. Manual valve
2. Solenoid No.2
3. O-ring
4. Detent spring
5. Plate
6. Spring
7. Ball
8. Solenoid No.1
9. Gasket
10. Lower valve body assembly
11. Plate
12. Front upper valve body
13. Rear upper valve body
14. Intermediate coast modulator valve
15. Low coast modulator valve
16. By-pass valve



60A50-7B1-118-1S

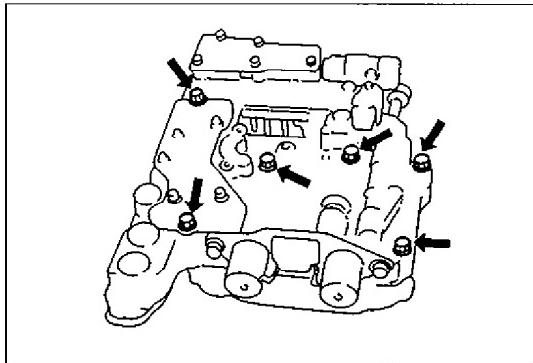
Disassembly

1. Remove detent spring, plate and manual valve.



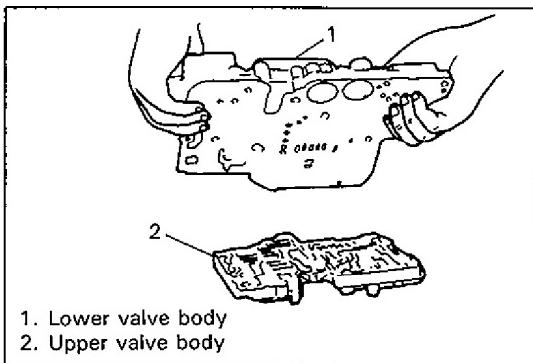
60A50-7B1-118-2S

2. Remove bolts from upper valve body side.



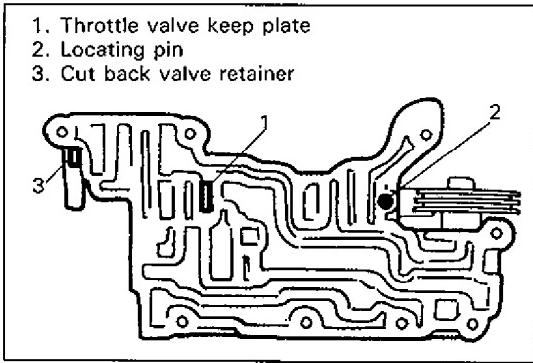
60A50-7B1-118-3S

3. Remove bolts from lower valve body side.



60A50-7B1-118-4S

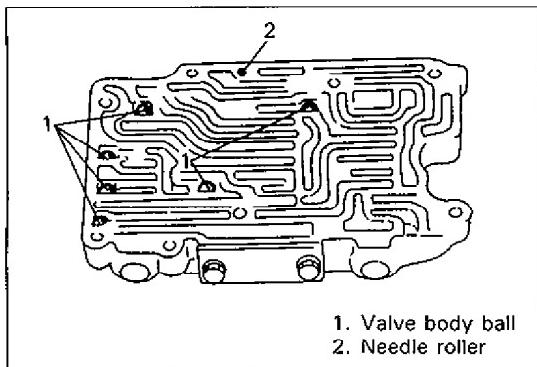
4. Separate upper valve body and lower valve body while pressing separator plate and valve body gasket against lower valve body to prevent balls, spring and others from coming out of valve body.



60A50-7B1-118-5S

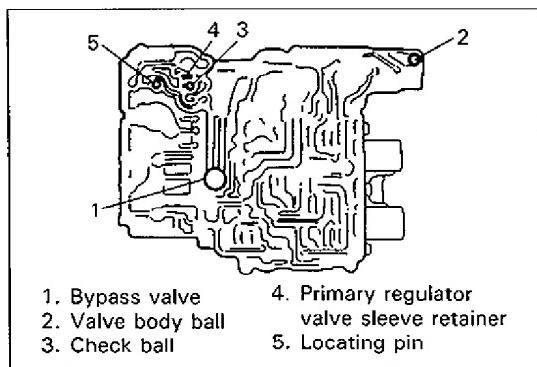
5. Confirm that there are valve, balls and plate as shown in figures.

- Front upper valve body assembly.



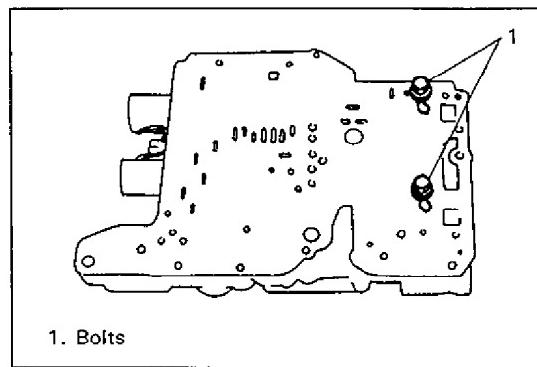
60A50-7B1-119-1S

- Rear upper valve body assembly.



60A50-7B1-119-2S

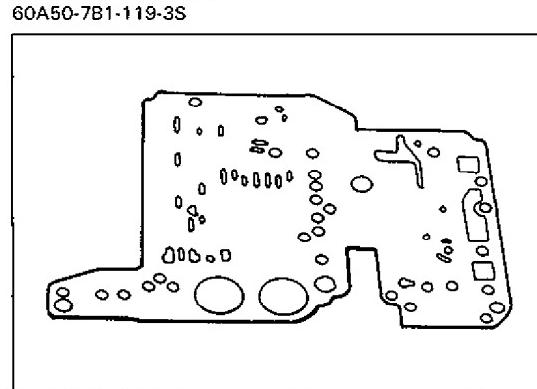
- Lower valve body assembly.



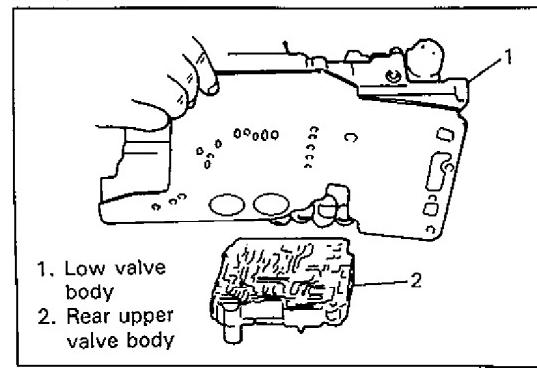
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Assembly

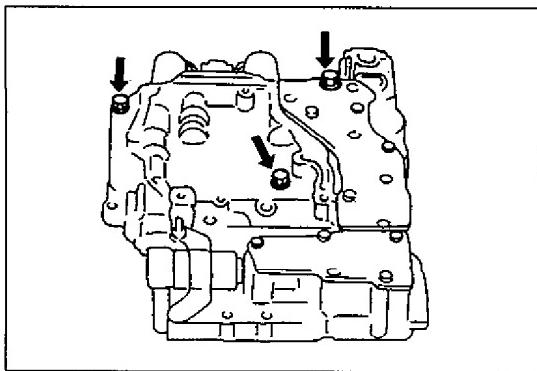
1. Place separator plate and new lower valve body gasket on lower valve body assembly and tighten installation section of front upper valve body assembly with 2 bolts temporarily.
2. Place new upper valve body gasket on lower valve body assembly
3. While holding upper valve body gasket and lower valve body assembly together, install it on rear upper valve body assembly.



60A50-7B1-119-4S

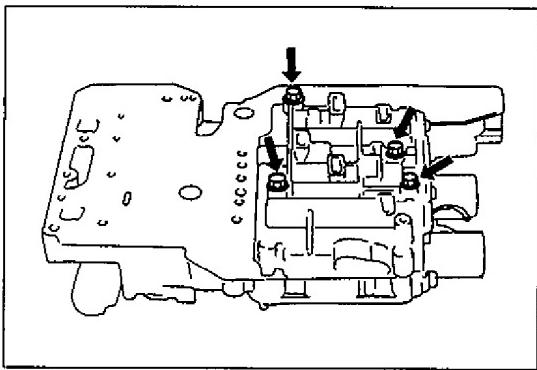


60A50-7B1-119-5S



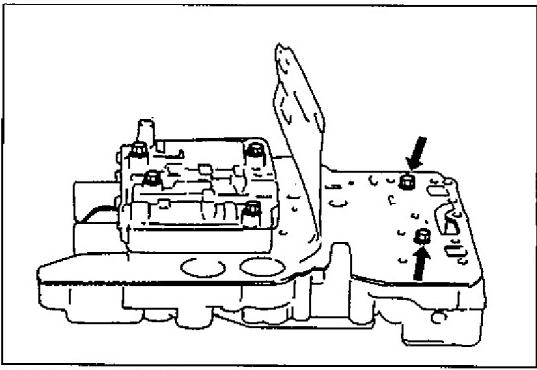
60A50-7B1-120-1S

4. Tighten 3 bolts indicated in figure at the left temporarily.



60A50-7B1-120-2S

5. Turn over lower valve body assembly and tighten 4 bolts indicated in figure at the left temporarily.

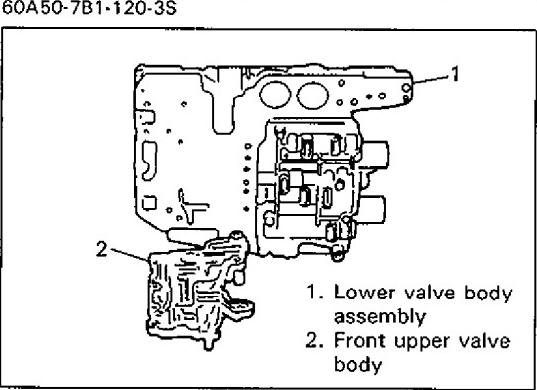


60A50-7B1-120-3S

6. Remove 2 bolts tightened temporarily in Step 1.

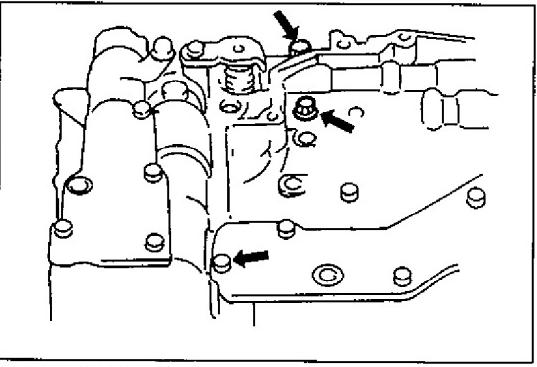
NOTE:

Be careful not to damage gasket.



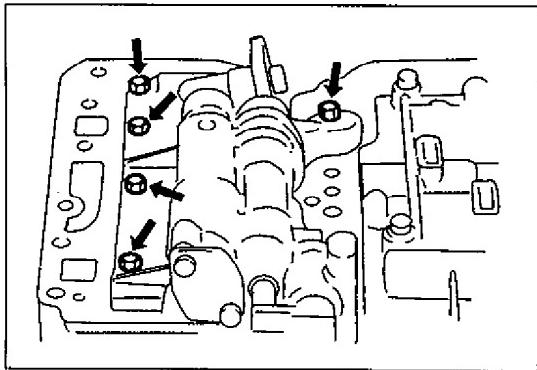
60A50-7B1-120-4S

7. Install lower valve body assembly on front upper valve body.



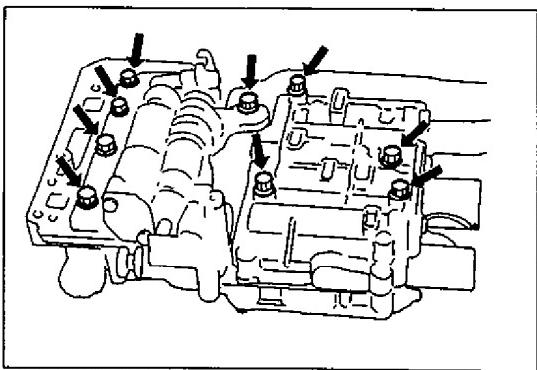
60A50-7B1-120-5S

8. Tighten 3 bolts indicated in figure at the left temporarily.



60A50-7B1-121-1S

9. Turn over control valve lower body and tighten 5 bolts indicated in figure at the left temporarily.



60A50-7B1-121-2S

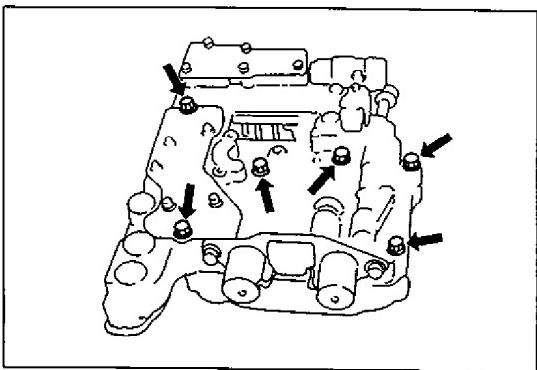
10. Tighten bolts on upper valve body side to specified torque.

Upper valve body bolt tightening torque:

5–6 N·m (0.5–0.6 kg·m, 3.7–4.3 lb·ft)

NOTE:

Tighten bolts by a certain amount of torque evenly and repeat it several times till specified torque is attained.



60A50-7B1-121-3S

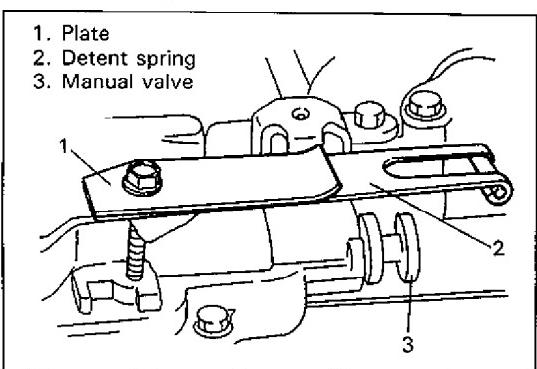
11. Tighten bolts on lower valve body inside to specified torque.

Lower valve body bolt tightening torque:

5–6 N·m (0.5–0.6 kg·m, 3.7–4.3 lb·ft)

NOTE:

Tighten bolts by a certain amount of torque evenly and repeat it several times till specified torque is attained.



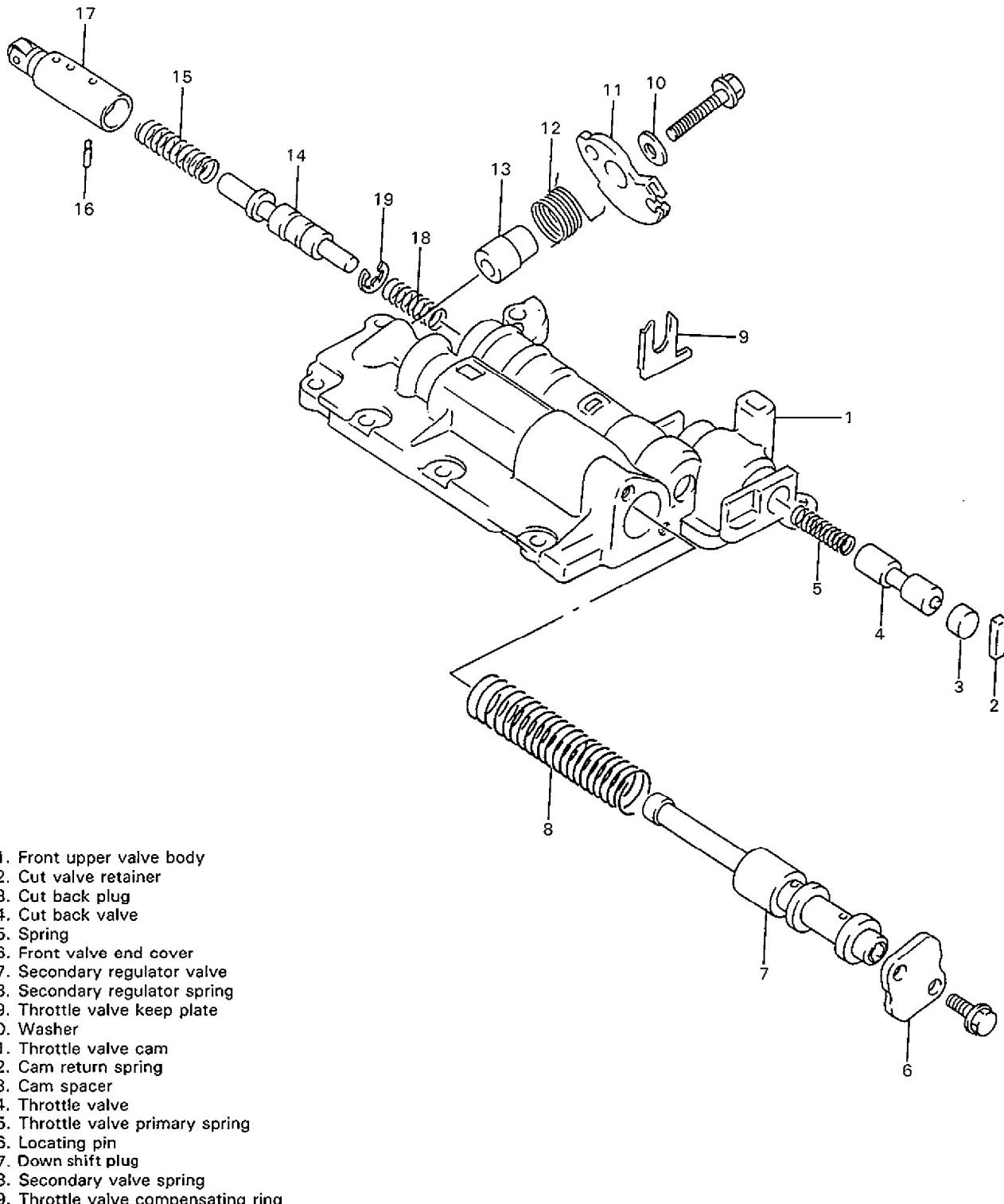
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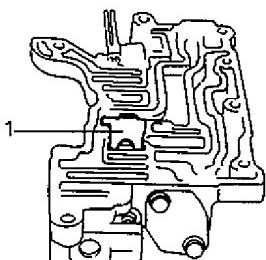
12. After installing manual valve, install detent spring and plate and tighten detent spring bolt to specified torque.

Detent spring bolt tightening torque:

5–6 N·m (0.5–0.6 kg·m, 3.7–4.3 lb·ft)

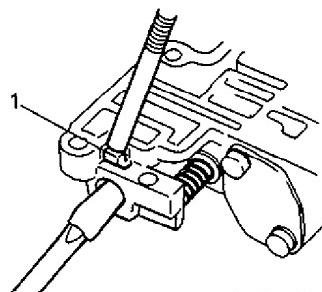
Front Upper Valve Body





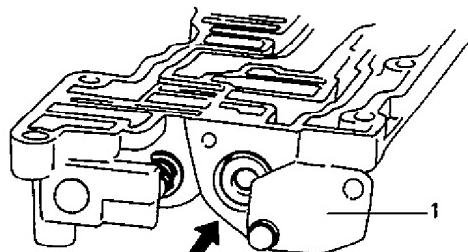
1. Throttle valve keep plate

60A50-7B1-123-1S



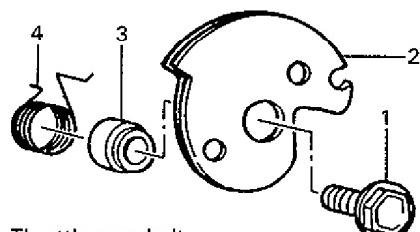
1. Cut back retainer

60A50-7B1-123-2S



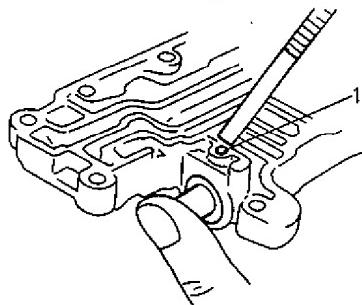
1. Front valve end cover

60A50-7B1-123-3S



1. Throttle cam bolt
2. Throttle valve cam
3. Cam spacer
4. Throttle cam return spring

60A50-7B1-123-4S



1. Locating pin

Disassembly

1. Remove throttle valve keep plate.

2. Using screwdriver with vinyl tape or the like wound around its tip, hold cut back valve plug and remove cut back retainer with magnet. Then remove cut back plug, cut back valve and cut back valve spring.

3. Remove one cover bolt on front valve end cover and loosen the other to move cover as shown in figure. Remove secondary regulator valve sub assembly and secondary regulator valve spring. Then remove remaining loose cover bolt to remove front valve end cover.

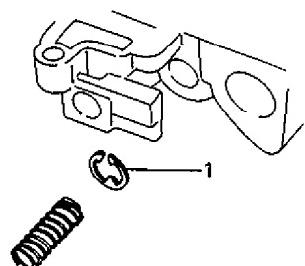
WARNING:

When moving cover, be sure to hold valve with finger to prevent secondary regulator valve sub assembly from jumping out.

4. Remove throttle cam bolt and then remove throttle valve cam, throttle cam return spring and cam spacer.

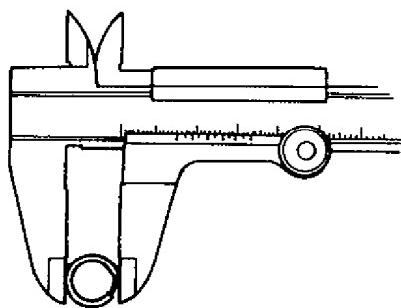
5. With throttle valve held as shown in figure, remove locating pin with magnet and then remove throttle valve and throttle valve primary spring.

60A50-7B1-123-5S

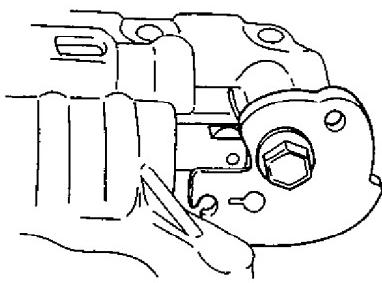


1. Throttle valve compensating ring

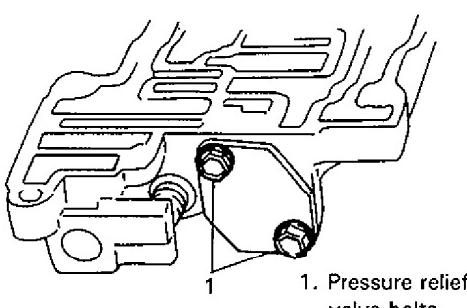
60A50-7B1-124-1S



60A50-7B1-124-2S



60A50-7B1-124-4S



1. Pressure relief valve bolts

6. Remove throttle valve and then remove secondary valve spring and throttle valve compensating ring(s).

NOTE:

Write down how many throttle valve compensating rings there were, for throttle pressure varies with number of them.

Assembly

Assemble each component by reversing disassembly procedure and noting following points.

- Coil outer diameter and free length of each valve spring should be as listed below. Be sure to use each one of correct size.

Name of spring	Outer diameter	Free length
Secondary regulator valve spring	17.43 mm (0.681 in)	71.23 mm (2.804 in)
Cut back valve spring	6.85 mm (0.269 in)	23.00 mm (0.905 in)
Secondary valve spring	8.58 mm (0.337 in)	19.24 mm (0.757 in)
Throttle valve primary spring	10.90 mm (0.429 in)	39.55 mm (1.557 in)

- Install as many throttle valve compensating rings as written down when disassembled.
- Tighten throttle cam bolt to specified torque.

Throttle cam bolt tightening torque:

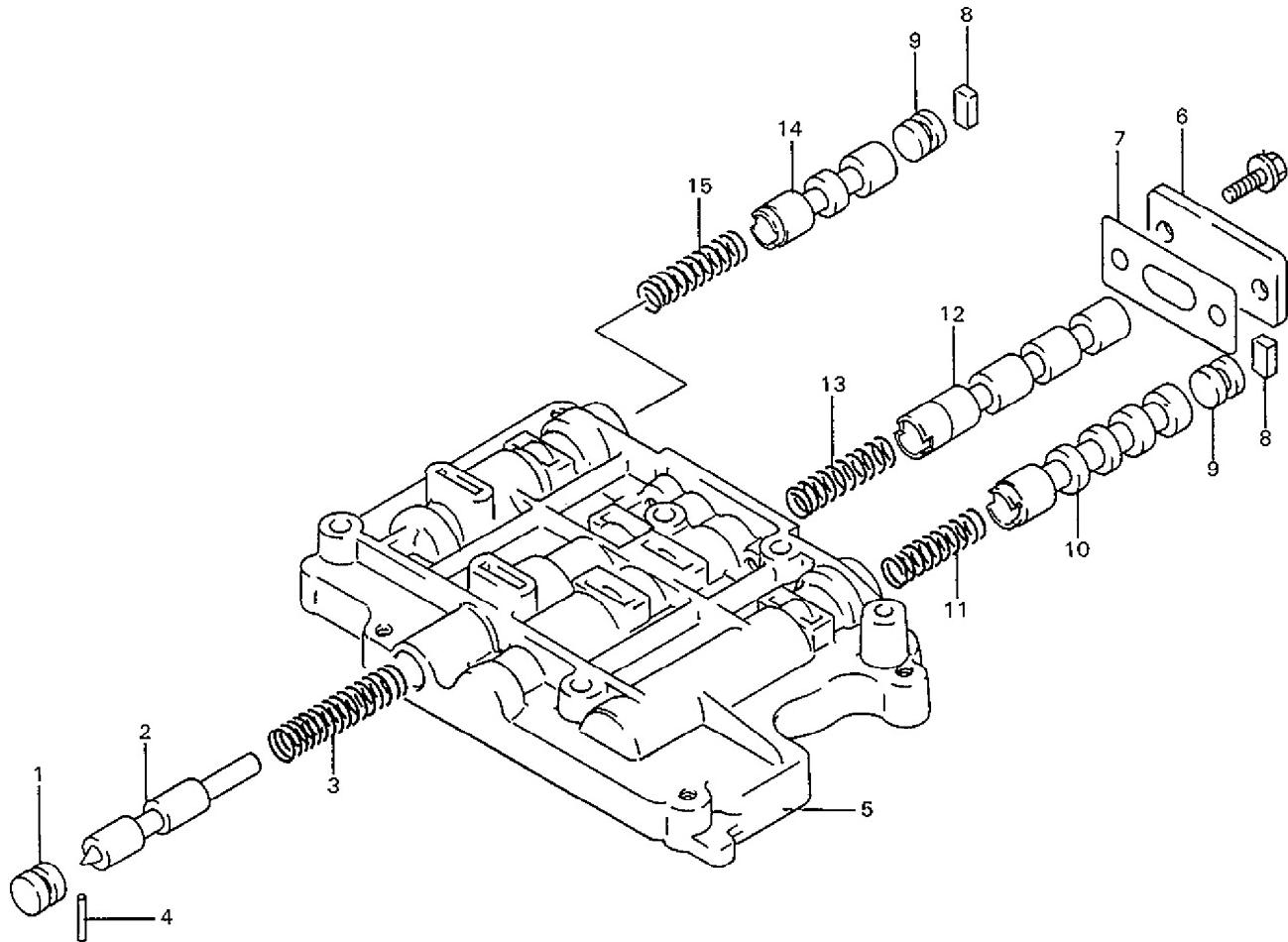
6–9 N·m (0.6–0.9 kg·m, 4.5–6.5 lb·ft)

- Tighten pressure relief valve bolts to specified torque.

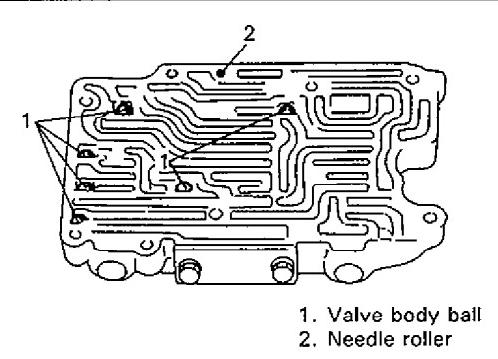
Pressure relief valve bolt tightening torque:

5–6 N·m (0.5–0.6 kg·m, 3.7–4.3 lb·ft)

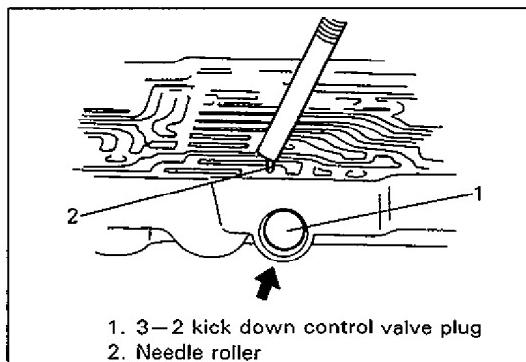
60A50-7B1-124-5S

Rear Upper Valve Body

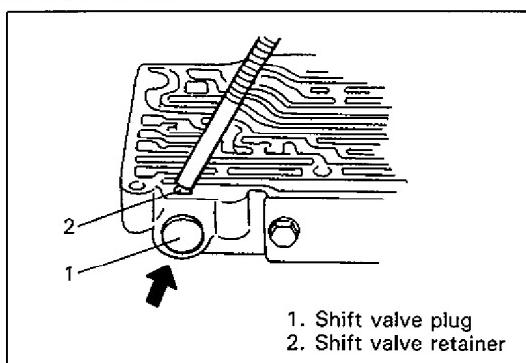
1. 3-2 kickdown control valve plug
2. Clutch sequence valve
3. Reverse brake sequence valve spring
4. Needle roller
5. Rear upper valve body
6. Plate
7. Gasket
8. Retainer
9. Shift valve plug
10. 2-3 shift valve
11. Shift valve spring
12. 1-2 shift valve
13. Shift valve spring
14. 3-4 shift valve
15. Shift valve spring



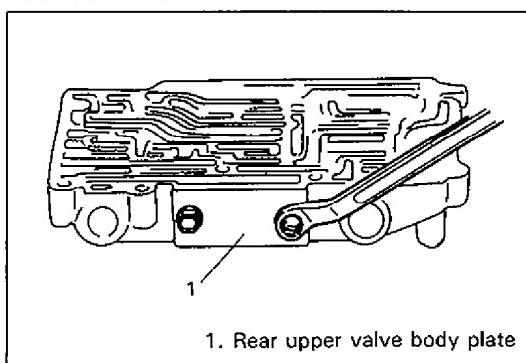
60A50-7B1-126-1S



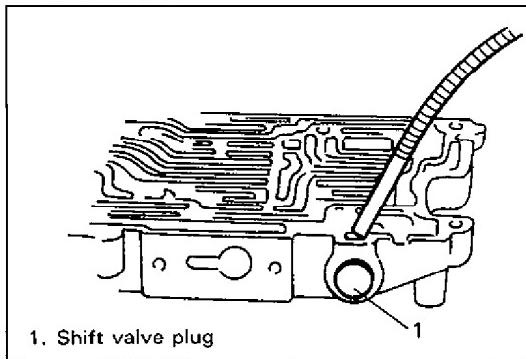
60A50-7B1-126-2S



60A50-7B1-126-3S



60A50-7B1-126-4S



60A50-7B1-126-5S

Disassembly

1. Take out 6 valve body balls.

2. With 3—2 kickdown control valve plug pressed with finger, take out needle roller with magnet. Then remove 3—2 kick-down control valve plug, clutch sequence valve and reverse brake sequence valve spring.

3. With shift valve plug pressed with finger, take out shift valve retainer with magnet and then remove shift valve plug and 3—4 shift valve spring.

4. Remove 2 plate bolts. Then remove rear upper valve body plate and rear upper valve body gasket and take out 1—2 shift valve and shift valve spring.

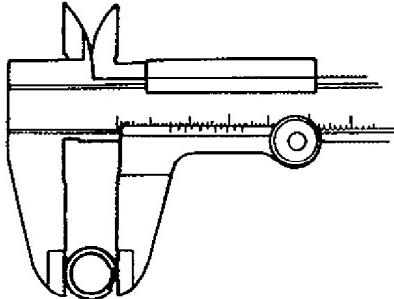
5. With shift valve plug pressed with finger, remove valve retainer with magnet and then remove shift valve plug, 2—3 shift valve and shift valve spring.

Assembly

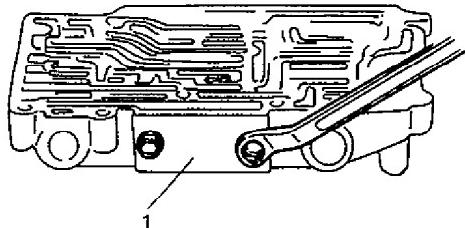
Assemble each component by reversing disassembly procedure and noting following points.

- Coil outer diameter and free length of each valve spring should be as listed below. Be sure to use each one of correct size.

Name of spring	Outer diameter	Free length
Reverse brake sequence valve spring	9.20 mm (0.362 in)	37.55 mm (1.478 in)
1–2 shift valve spring		
2–3 shift valve spring	8.90 mm (0.350 in)	29.15 mm (1.147 in)
3–4 shift valve spring		



60A50-7B1-127-1S



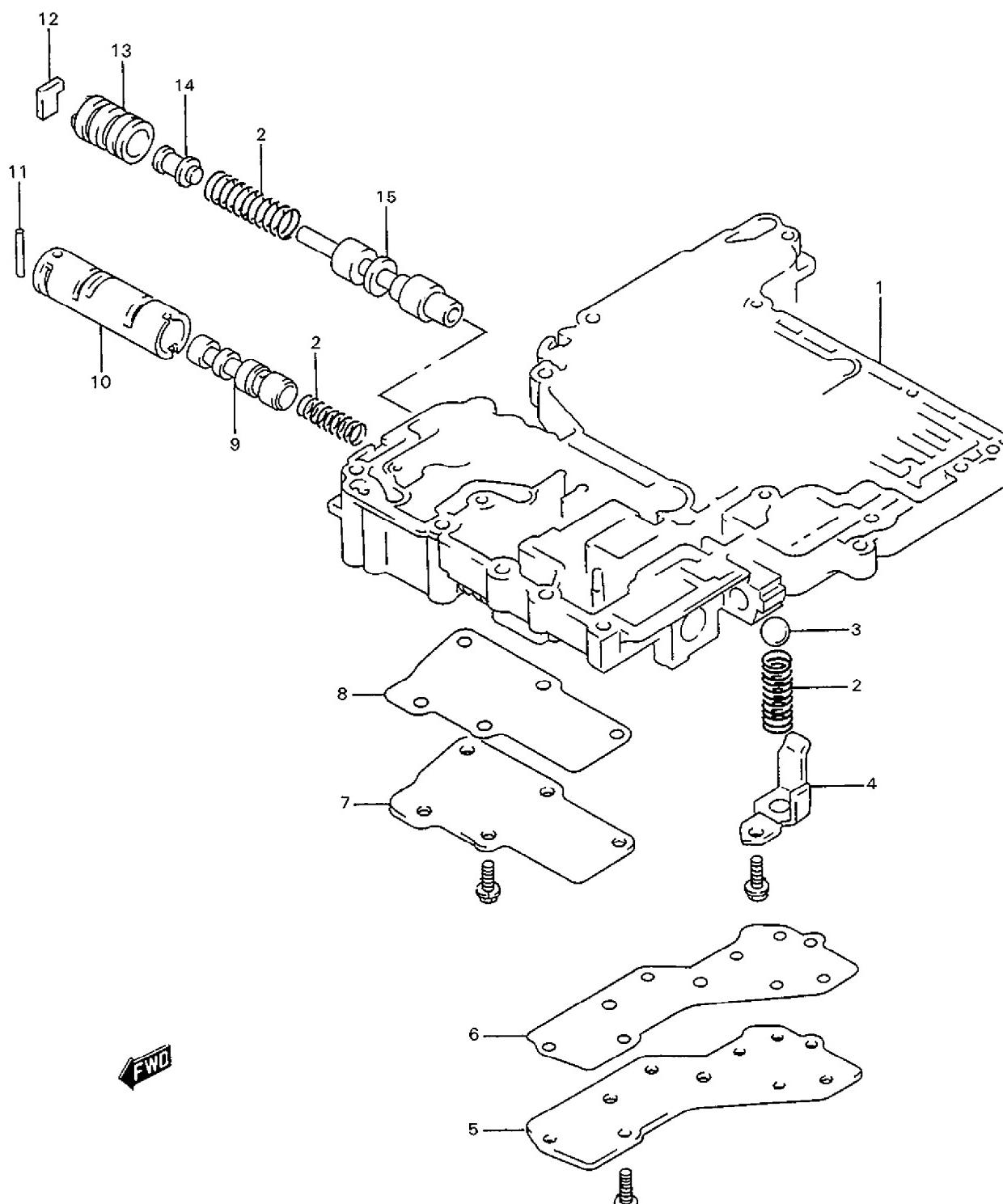
1. Rear upper valve body plate

60A50-7B1-127-3S

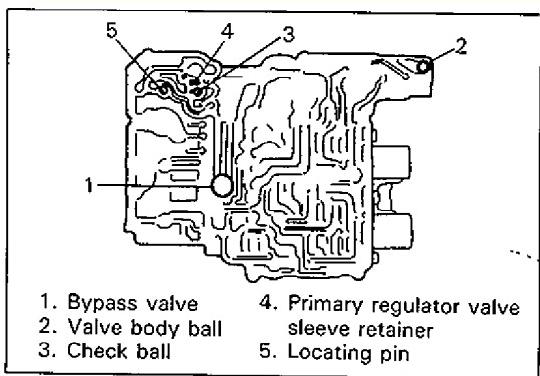
- Use new rear upper valve body gasket.
- Tighten plate bolt to specified torque.

Plate bolt tightening torque:

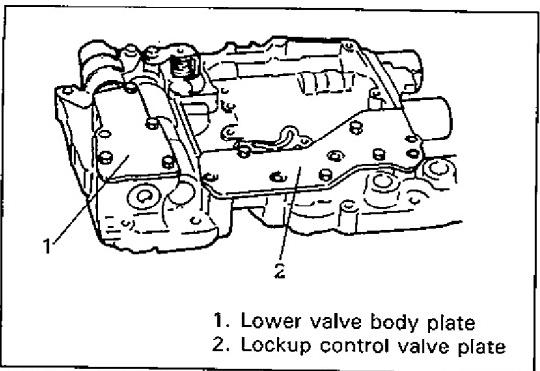
5–6 N·m (0.5–0.6 kg·m, 3.7–4.3 lb·ft)

Lower Valve Body

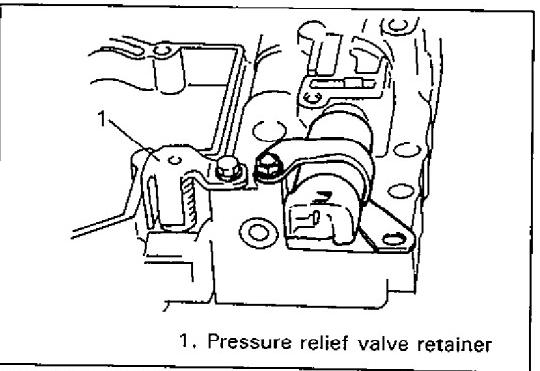
1. Lower valve body
 2. Spring
 3. Pressure relief valve ball
 4. Pressure relief valve retainer
 5. Lower valve body plate
 6. Lower valve body gasket
 7. Lockup control valve plate
 8. Lockup control valve gasket
 9. Lockup control valve
 10. Lockup control valve
 11. Pin
 12. Retainer
 13. Primary regulator valve sleeve
 14. Primary regulator valve plunger
 15. Primary regulator valve



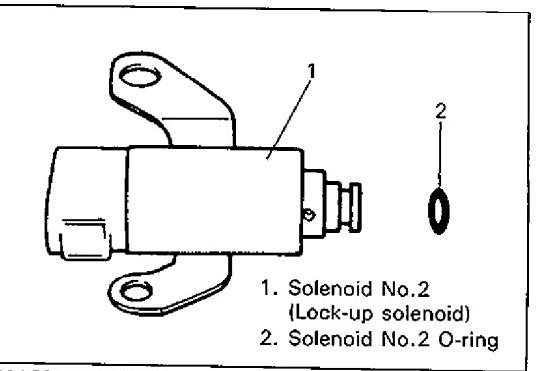
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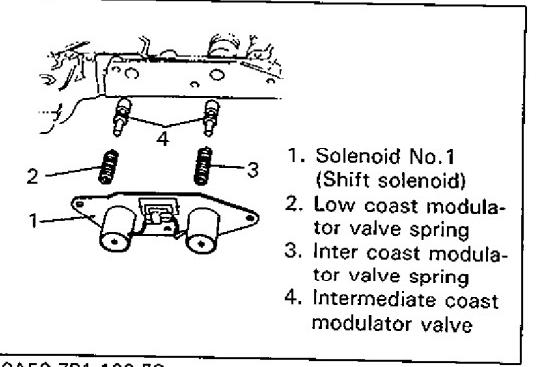
60A50-7B1-129-2S



60A50-7B1-129-3S



60A50-7B1-129-4S



60A50-7B1-129-5S

Disassembly

1. Remove bypass valve, bypass valve spring, check ball, valve damping spring, valve body ball and ball valve spring.

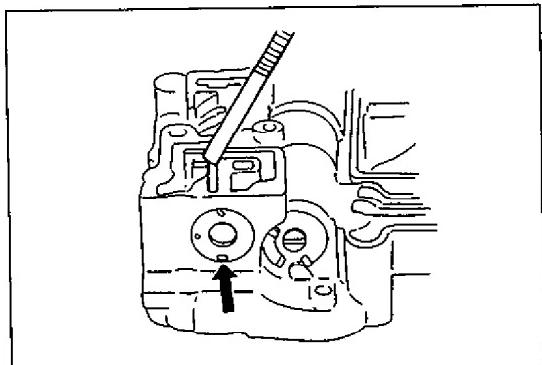
2. Remove lower valve body plate and lower valve body plate gasket.

3. Remove lock-up control valve plate and lock-up control valve gasket.

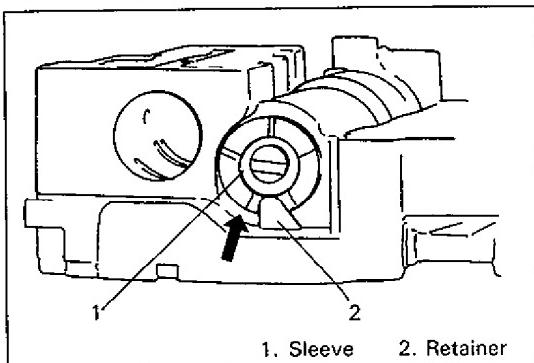
4. With pressure relief valve retainer pressed with finger, remove pressure relief valve bolt and then remove pressure relief valve retainer, pressure relief valve spring and pressure relief valve ball.

5. Remove lock-up solenoid and then remove O-ring from lock-up solenoid.

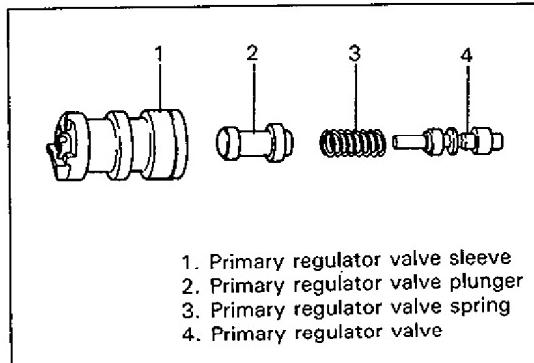
6. After removing shift solenoid (A & B), remove solenoid gasket, low coast modulator valve spring, intercoast modulator valve spring and 2 intermediate coast modulator valves.



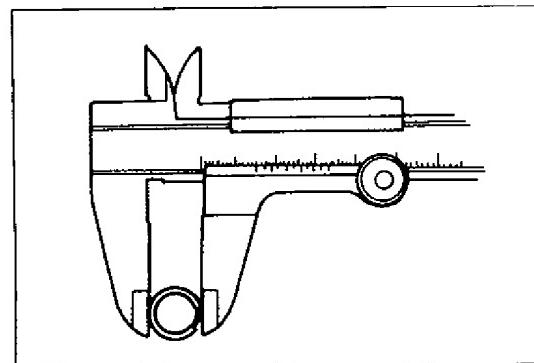
60A50-7B1-130-1S



60A50-7B1-130-2S



60A50-7B1-130-3S



60A50-7B1-130-4S

7. Pressing lockup control sleeve with finger and using magnet, remove locating pin and then remove lockup control sleeve, lockup control valve and lockup control valve spring.

8. Check which step of primary regulator valve sleeve (how many steps down from its tip) contacts primary regulator valve sleeve retainer.

9. Pressing primary regulator valve sleeve with finger and using magnet, remove primary regulator valve sleeve retainer and then remove primary regulator valve sleeve, primary regulator valve plunger, primary regulator valve spring and primary regulator valve.

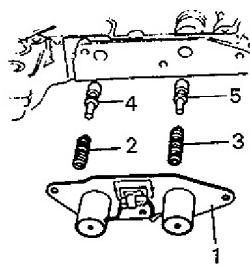
Assembly

Assemble each component by reversing disassembly procedure and noting following points.

- Coil outer diameter and free length of each valve spring should be as listed below. Be sure to use each one of correct size.

Name of spring	Outer diameter	Free length
Pressure relief valve spring	13.14 mm (0.517 in)	32.14 mm (1.265 in)
Lockup control valve spring	11.30 mm (0.445 in)	34.60 mm (1.362 in)
Valve damping spring	4.95 mm (0.195 in)	20.00 mm (0.787 in)
Low coast modulator valve spring	10.00 mm (0.394 in)	42.35 mm (1.667 in)
Inter coast modulator valve spring	8.80 mm (0.347 in)	35.43 mm (1.395 in)
Ball valve spring	11.11 mm (0.437 in)	32.14 mm (1.265 in)
Bypass valve spring	13.82 mm (0.544 in)	33.32 mm (1.312 in)
Primary regulator valve spring	17.20 mm (0.677 in)	50.28 mm (1.980 in)

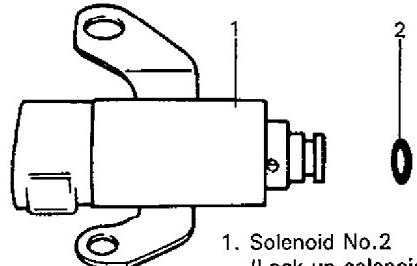
60A50-7B1-130-5S



1. Solenoid No.1 (Shift solenoid)
2. Low coast modulator valve spring
3. Inter coast modulator valve spring
4. Intermediate coast modulator valve
5. Low coast modulator valve

60A50-7B1-131-1S

- Install primary regulator valve sleeve so that its tip is positioned as it was before disassembly.
- Use new lockup control gasket, solenoid gasket and lower valve body plate gasket.
- Tighten shift solenoid bolt to specified torque.

Shift solenoid bolt tightening torque:**8—12 N·m (0.8—1.2 kg·m, 6.0 —8.5 lb·ft)**

1. Solenoid No.2 (Lock-up solenoid)
2. Solenoid No.2 O-ring

60A50-7B1-131-2S

- Tighten lock-up solenoid bolt to specified torque.

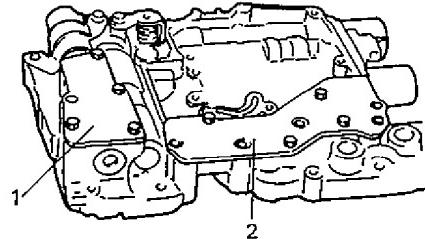
Lock-up solenoid bolt tightening torque:**5—6 N·m (0.5—0.6 kg·m, 3.7—4.3 lb·ft)**

- Tighten pressure relief valve bolt to specified torque.

Pressure relief valve bolt tightening torque:**5—6 N·m (0.5—0.6 kg·m, 3.7—4.3 lb·ft)**

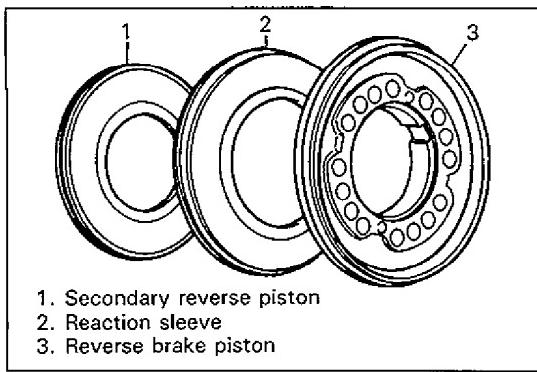
- Use new O-ring.

- Tighten lower valve body plate, lockup control valve plate flange bolt to specified torque.

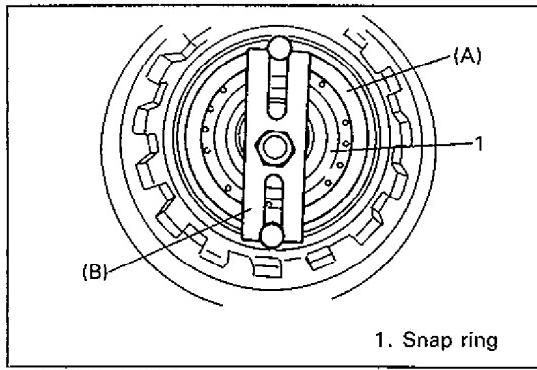
Plate bolt tightening torque:**5—6 N·m (0.5—0.6 kg·m, 3.7—4.3 lb·ft)**

1. Lower valve body plate
2. Lockup control valve plate

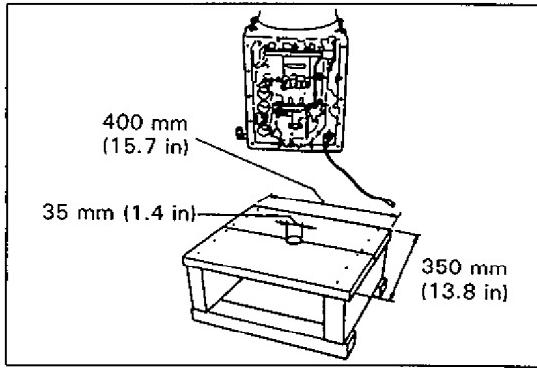
60A50-7B1-131-3S



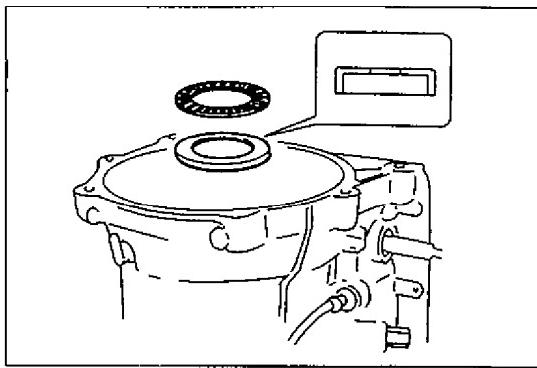
60A50-7B1-132-1S



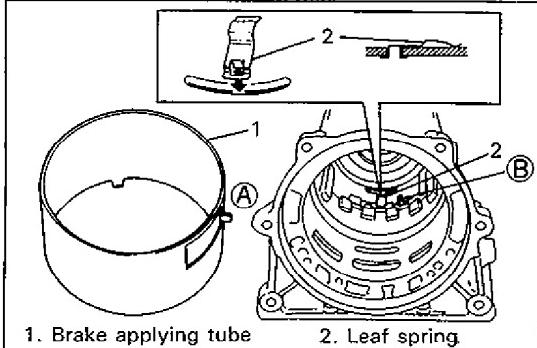
60A50-7B1-132-2S



60A50-7B1-132-3S



60A50-7B1-132-4S



60A50-7B1-132-5S

UNIT ASSEMBLY

- After applying A/T fluid to new O-rings, install them to reverse brake piston, reaction sleeve and secondary reverse piston.

- Install reverse brake piston assembly and brake piston return spring to transmission case, using care not to damage O-ring. Then install snap ring with special tool.

Special Tool

(A): 09926-98320 (B) : 09926-98390

NOTE:

- Install so that opening in snap ring will not align with any of 3 lugs of spring seat.
- Do not compress spring more than necessary and do not allow it fall or tilt.

- Prepare a stand as shown at the left. It is necessary because work will be done with transmission case set upright from this step on.

NOTE:

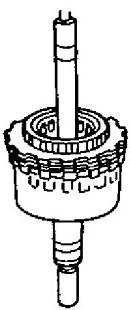
- To protect transmission case against damage, spread cloth on stand where case contacts.
- A stand of such size as shown in figure will facilitate work.

- Install thrust output shaft bearing and thrust bearing output shaft race after lubricating them with grease.

NOTE:

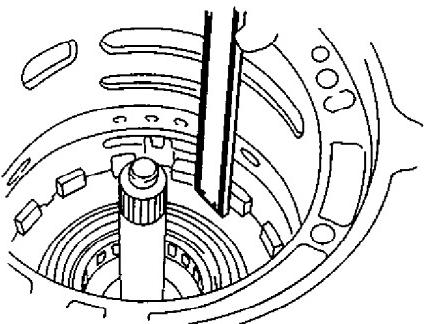
Make sure that thrust bearing output shaft race is installed in proper direction.

- Install brake applying tube so that its lug (A) fits in (B) in transmission case. After installation, check that 4 lugs along the underside of brake applying tube fit inside of reverse brake piston and leaf spring is installed properly.



60A50-7B1-133-1S

- Remove reverse brake reaction plate of planetary gear assembly and align lugs of reverse brake plate, reverse brake disc and reverse brake packing plate. Install planetary gear assembly to transmission case so that aligned lugs fit in groove in transmission case.



60A50-7B1-133-2S

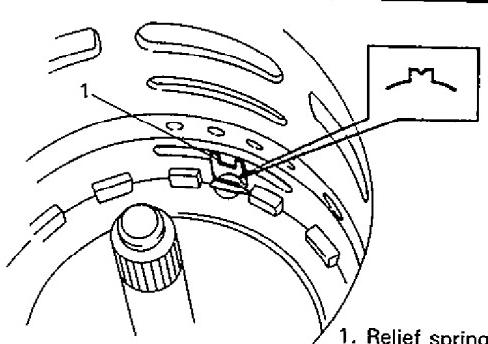
- Measure clearance between reverse brake plate and lugs of transmission case.

Standard clearance between reverse brake plate and lugs of transmission case:

0.72—2.50 mm (0.029—0.098 in)

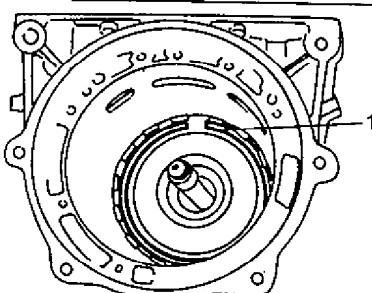
If measured value is less than standard range, it is possible that something is installed improperly or dust or fluid is on reverse brake disc, etc. If it exceeds standard range, replace reverse brake disc, reverse brake plate or reverse brake backing plate.

- Install reverse brake reaction plate so that its lug with dent comes to the same position as leaf spring.



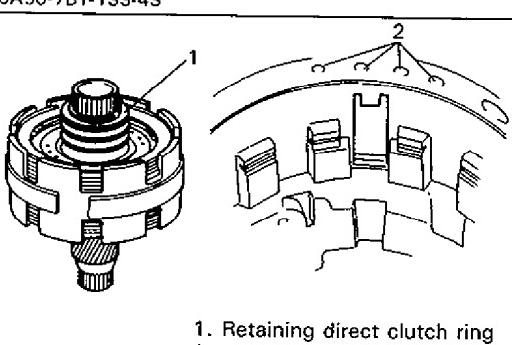
60A50-7B1-133-3S

- Using screwdriver with vinyl tape or the like wound at its tip, install retaining reaction plate ring. After installation, check that ring is in groove securely.



1. Retaining ring

60A50-7B1-133-4S



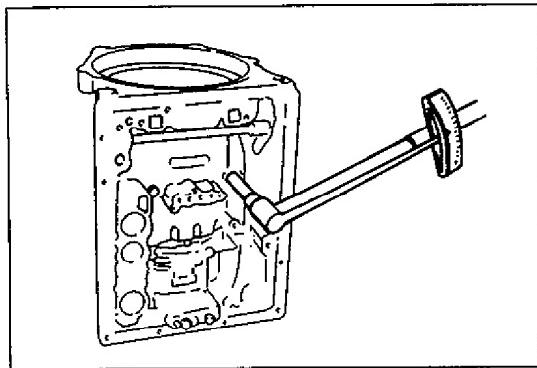
1. Retaining direct clutch ring
2. Oil holes

60A50-7B1-133-5S

- After confirming that lugs of all brake plates and brake discs are in grooves securely, hold retaining direct clutch ring of planetary sun gear, install center support assembly by aligning fluid holes in center support and transmission case.

NOTE:

Unless retaining direct clutch ring of planetary sun gear is held, brake valve gets off center support and that will make it impossible to align fluid holes with bolt holes.

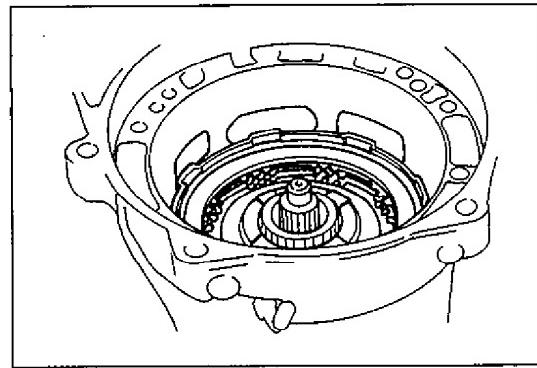


60A50-7B1-134-1S

11. Tighten center support bolts by certain amount at a time till specified tightening torque is obtained.

Center support bolt tightening torque:

24–28 N·m (2.4–2.8 kg·m, 17.5–20.0 lb·ft)

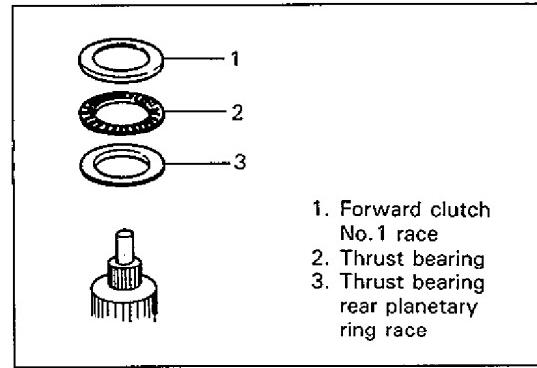


60A50-7B1-134-2S

12. Install direct clutch assembly by aligning splines in direct clutch cylinder with planetary sun gear.

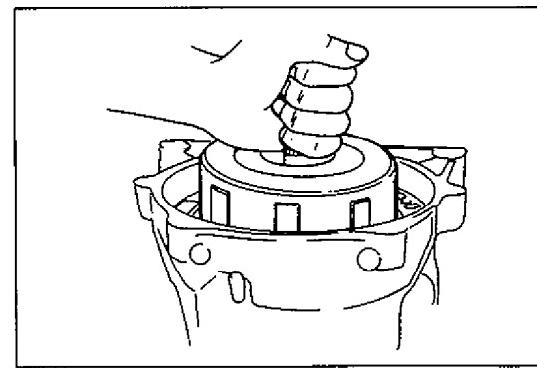
NOTE:

Ends of splines in direct clutch cylinder and planetary sun gear should come almost in match.



60A50-7B1-134-3S

1. Forward clutch No.1 race
2. Thrust bearing
3. Thrust bearing rear planetary ring race



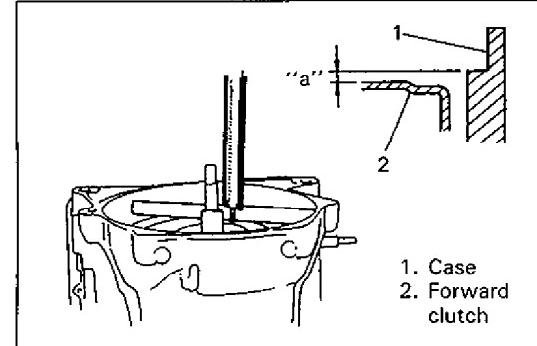
60A50-7B1-134-4S

13. Apply grease to forward clutch rear No.1 race, thrust rear bearing, thrust bearing rear planetary ring race and install thrust bearing planetary ring race to direct clutch cylinder and forward clutch rear No.1 race and thrust bearing to forward clutch hub.

14. Install forward clutch assembly by putting all lugs of direct clutch disc hub together and matching them with groove cut in direct clutch input hub, and at the same time aligning splines in forward clutch hub with inner shaft.

NOTE:

Use care not to let forward clutch rear No.1 race and thrust bearing installed to forward clutch hub fall off.



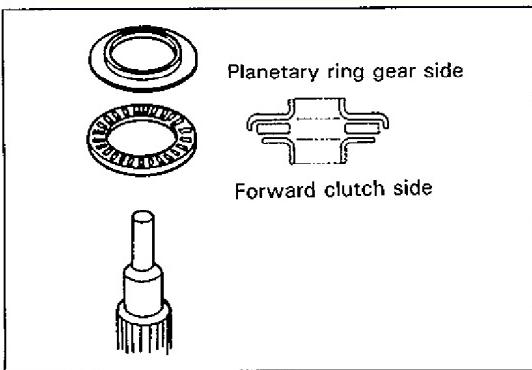
60A50-7B1-134-5S

15. When clutch disc and plate have been replaced, check height difference between forward clutch input shaft and transmission case by measuring as shown in figure.

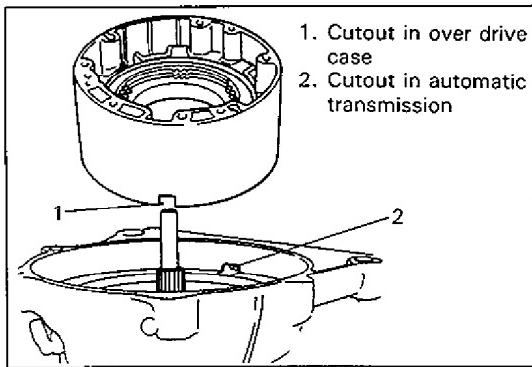
Standard height difference "a": About 3.0 mm (About 0.118 in)

NOTE:

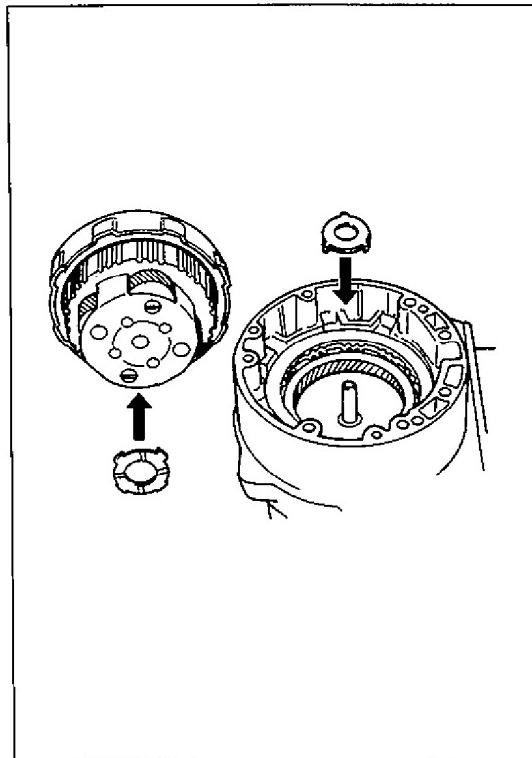
If measured value is less than standard value, remove forward clutch assembly and install it again.



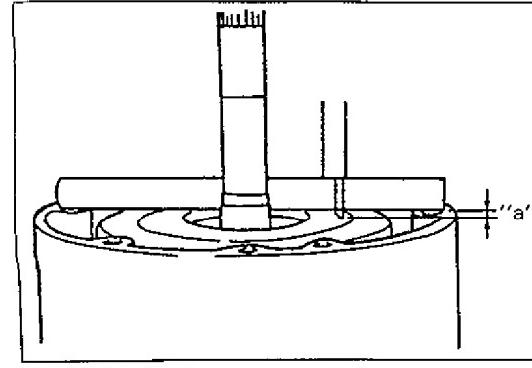
60A50-7B1-135-1S



60A50-7B1-135-2S



60A50-7B1-135-3S



60A50-7B1-135-5S

16. Apply grease to thrust forward clutch bearing and install it to forward clutch input shaft. Also apply grease to thrust rear race and install it to O/D case.

17. Install O/D case by aligning cutout in O/D case and that in transmission case.

NOTE:

Use care not to drop thrust rear race installed to O/D case.

18. Apply grease to thrust planetary rear washer and install it to O/D planetary gear. Also apply grease to thrust planetary ring front race and install it to planetary ring gear and then install O/D input shaft assembly to O/D case.

NOTE:

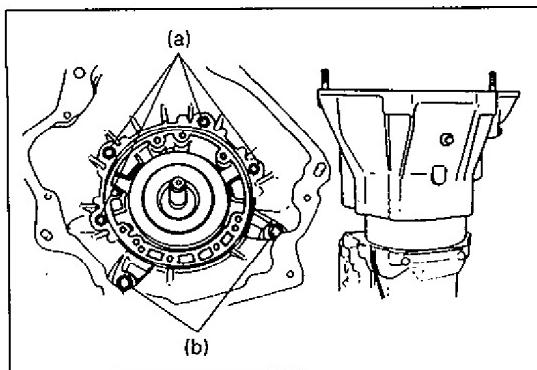
- Fit claws of thrust planetary rear washer and thrust planetary ring front race into holes securely.
- Use care not to drop thrust planetary rear washer installed to O/D planetary gear.

19. When clutch disc or plate has been replaced, check height difference between O/D case and O/D clutch cylinder by measuring it as shown in figure.

Standard height difference "a": About 2.0 mm (About 0.078 in)

NOTE:

Measure at the highest point along inner circumference of O/D clutch cylinder.

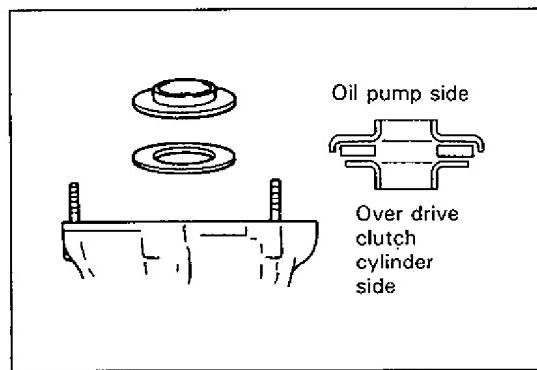


60A50-7B1-136-1S

20. Apply A/T fluid to new housing O-ring and install it to O/D case. Then install converter housing and tighten housing bolt to specified torque.

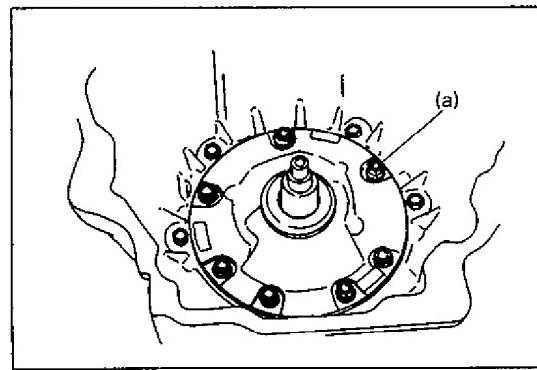
Tightening Torque

- (a): 27–42 N·m (2.7–4.2 kg·m, 20.0–30.0 lb·ft)
 (b): 48–68 N·m (4.8–6.8 kg·m, 35.0–49.0 lb·ft)



60A50-7B1-136-2S

21. Apply grease to thrust front race and install it to O/D clutch cylinder.

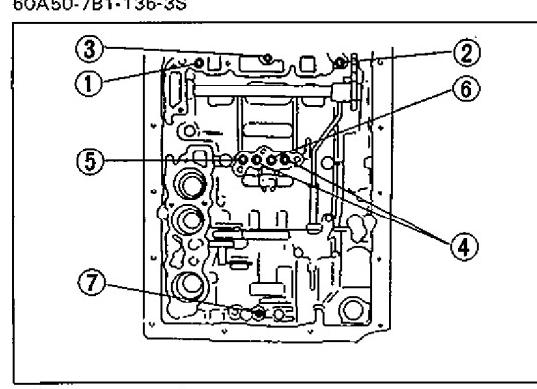


60A50-7B1-136-3S

22. Apply grease to front bearing assembly and install it to oil pump assembly. Also, apply A/T fluid to new oil pump cover O-ring and install it to oil pump assembly. Then install oil pump assembly aligning bolt holes in O/D case with those in transmission case oil pump assembly. Apply seal packing to oil pump assembly bolts and tighten them by certain amount of torque at each time one after another till specified torque is attained.

Tightening Torque

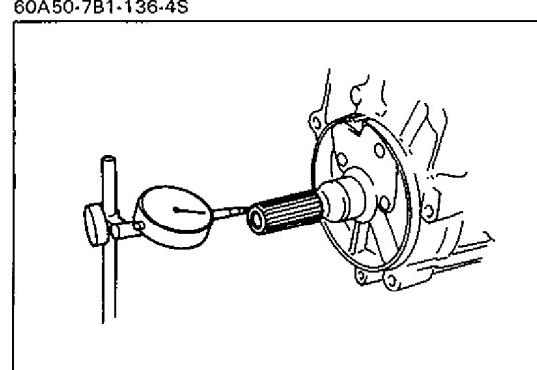
- (a): 18–25 N·m (1.8–2.5 kg·m, 13.5–18.0 lb·ft)



60A50-7B1-136-4S

23. Apply 2–4 kg/cm² air pressure into fluid holes in figure as numbered and check operation sound of each part.

- ① O/D clutch
- ② O/D brake
- ③ Forward clutch
- ④ Direct clutch
- ⑤ B1 brake (Second coast brake)
- ⑥ B2 brake (Second brake)
- ⑦ Reverse brake

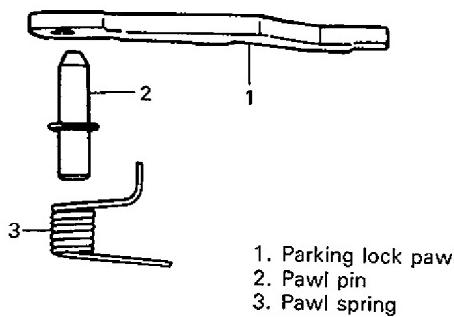


60A50-7B1-136-5S

24. Take down transmission from stand and measure clearance in shaft direction by applying dial gauge to output shaft as shown in figure.

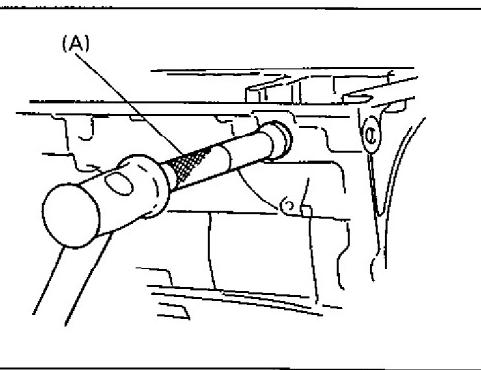
Standard clearance: 0.3–0.9 mm (0.012–0.035 in)

25. Check that inner shaft runs smoothly.



60A50-7B1-137-1S

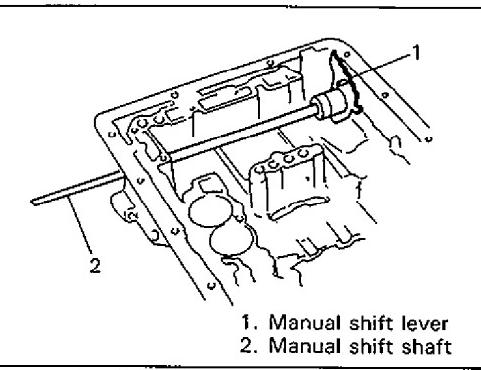
26. Install parking lock pawl, pawl pin and pawl spring to transmission case.



60A50-7B1-137-2S

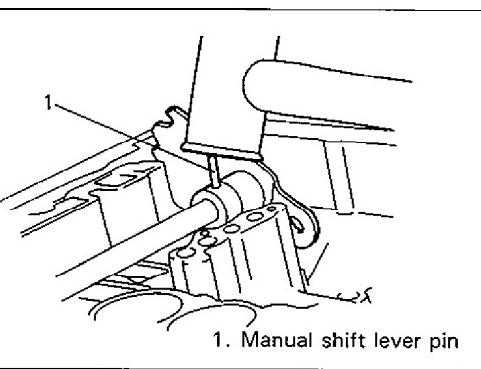
27. Apply grease to lip of new oil lip seal and drive in oil lip seal with special tool till it contacts transmission case.

Special Tool
(A): 09943-88211



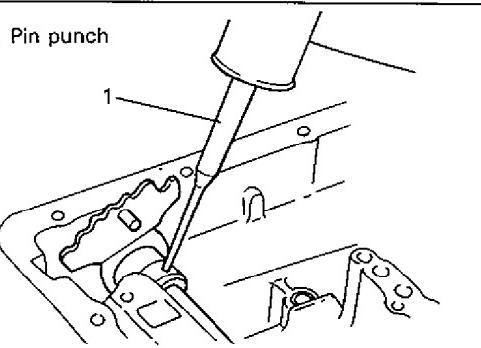
60A50-7B1-137-3S

28. After installing new sleeve cover to manual shift lever, install manual shift shaft and manual shift lever to transmission case.



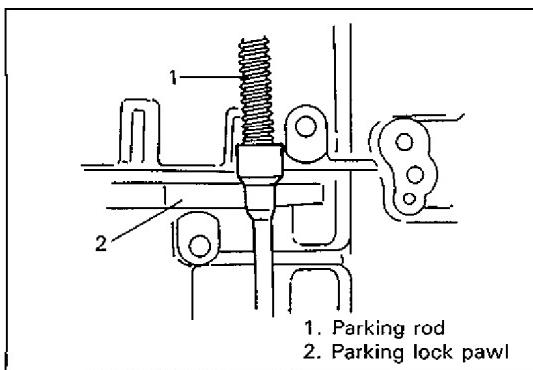
60A50-7B1-137-4S

29. Align hole in manual shift shaft with that in manual shift lever and drive in new manual shift lever pin.

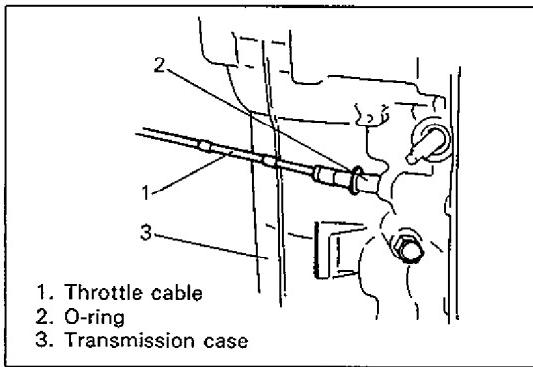


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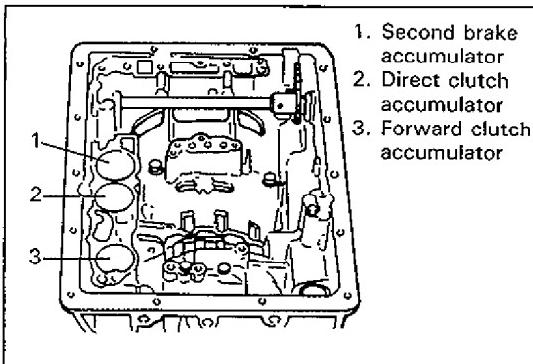
30. Align hole in sleeve cover with dent in manual shift lever and caulk securely with pin punch. Then check that manual shift shaft turns smoothly.



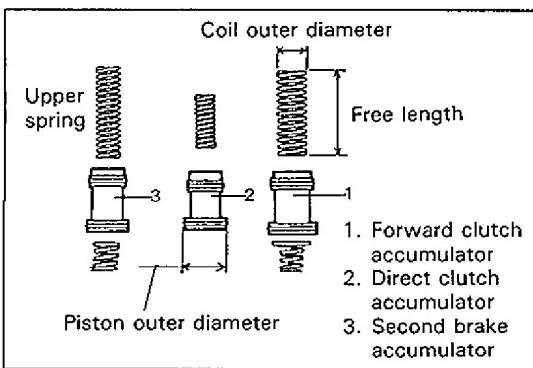
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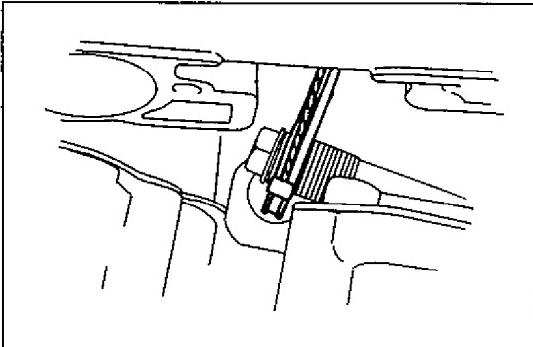
60A50-7B1-138-2S



60A50-7B1-138-3S



60A50-7B1-138-4S



60A50-7B1-138-5S

31. With parking lock rod installed to manual shift lever, place parking lock rod on parking lock pawl as shown in figure. Then install pawl bracket and tighten bracket screw to specified torque.

Bracket screw tightening torque:

6–9 N·m (0.6–0.9 kg·m, 4.5–6.5 lb·ft)

32. Apply A/T fluid to new throttle cable O-ring and install it to throttle cable then connect throttle cable to transmission case.

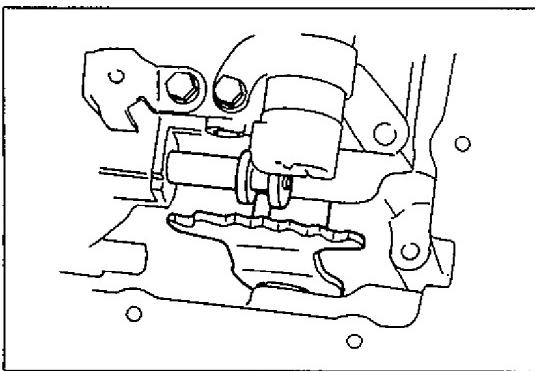
NOTE:

Do not turn transmission case toward position where throttle cable is connected so as to protect retainer of throttle cable.

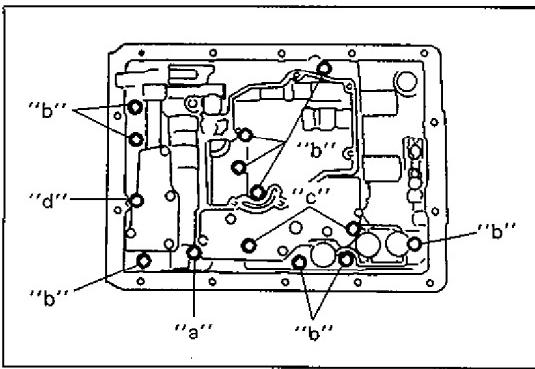
33. Apply A/T fluid to new O-ring and spring and install them to accumulator piston and install accumulator piston to transmission case.

Used for	Piston outer diameter	Spring free length
Direct clutch accumulator	31.80–31.85 mm (1.252–1.254 in)	Upper spring 55.18 mm (2.172 in)
		Lower spring —
Forward clutch accumulator		Upper spring 57.18 mm (2.251 in)
		Lower spring 29.50 mm (1.161 in)
Second brake accumulator	34.80–34.85 mm (1.370–1.372 in)	Upper spring 55.18 mm (2.172 in)
		Lower spring 35.13 mm (1.383 in)

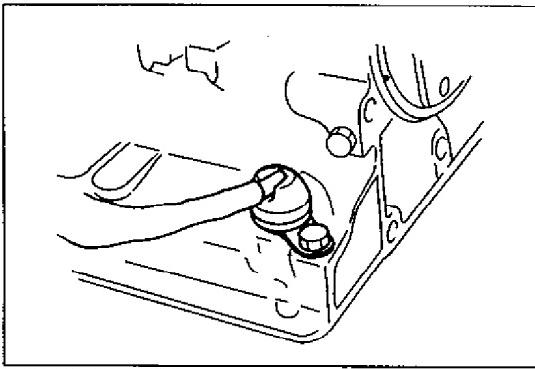
34. Lift valve body a little and install nipple of throttle cable to throttle valve cam.



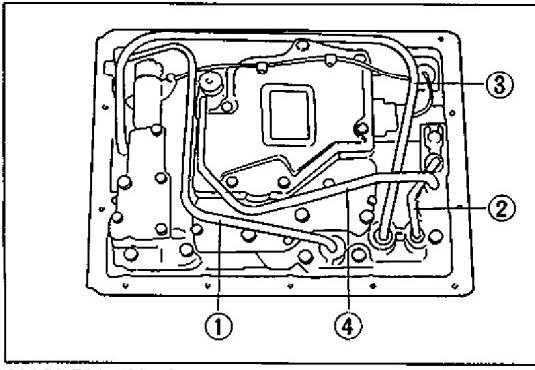
60A50-7B1-139-1S



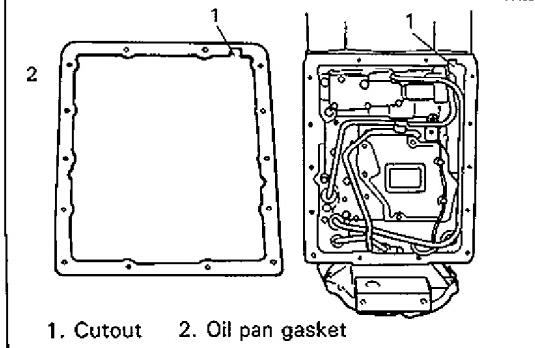
60A50-7B1-139-2S



60A50-7B1-139-3S



60A50-7B1-139-4S



60A50-7B1-139-5S

35. After confirming that accumulator piston is pushed all the way down, match pin of manual shift lever with groove in manual valve.

36. Fix valve body by using bolts with each nominal length as indicated in figure and tightening to specified torque.

Valve body bolt tightening torque:

8—12 N·m (0.8—1.2 kg-m, 6.0—8.5 lb-ft)

Valve body bolt nominal length:

"a": 25 mm (0.98 in) "c": 47 mm (1.85 in)

"b": 30 mm (1.18 in) "d": 60 mm (2.36 in)

37. Install new gaskets, oil screen spacer and oil screen.

Oil screen bolt tightening torque:

5—6 N·m (0.5—0.6 kg-m, 3.7—4.3 lb-ft)

38. Lubricate new O-ring with A/T fluid and attach it to grommet of solenoid wire harness. Then connect solenoid wire harness to transmission case and fix it with solenoid wire harness clamp. Connect each connector to solenoid. And install new gasket and brake applying cover.

Brake applying cover bolt tightening torque:

8—12 N·m (0.8—1.2 kg-m, 6.0—8.5 lb-ft)

39. Using a plastic hammer, connect ①; forward clutch applying tube, ②; lube applying tube, ③; reverse brake applying tube and ④; brake applying tube in such order as shown in figure.

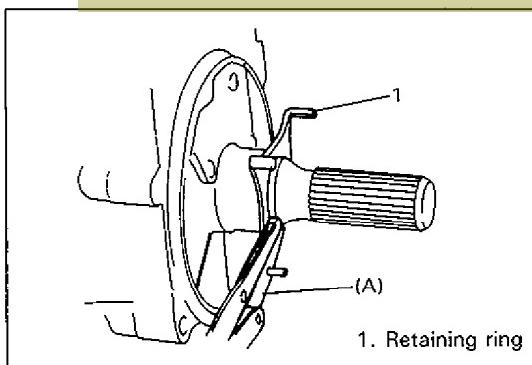
40. Install 2 oil pan magnets to transmission oil pan in such way that they do not interfere with oil tubes and install transmission oil pan with new oil pan gasket.

NOTE:

Align cutout in oil pan gasket with that in transmission case.

Transmission oil pan bolt tightening torque:

4—5 N·m (0.4—0.5 kg-m, 3.0—3.5 lb-ft)

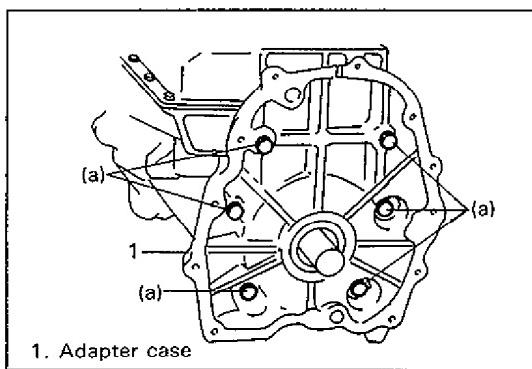


60A50-7B1-140-1S

41. With wood rough key attached to output shaft, install rotor sensor by aligning its key groove with wood rough key and install retaining rotoring by using special tool.

Special Tool

(A): 09920-76010

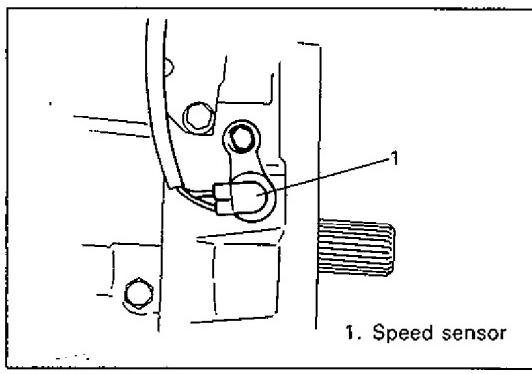


60A50-7B1-140-2S

42. Install adapter case with new adapter gasket to transmission case and tighten adapter case bolts to specified torque.

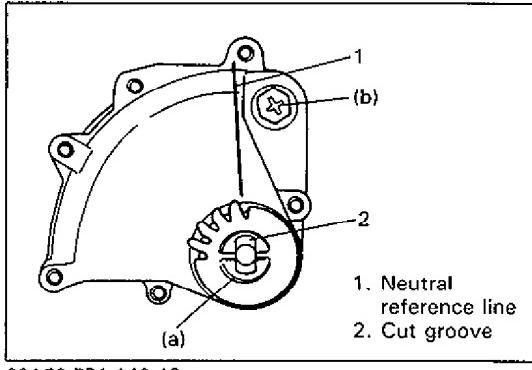
Tightening Torque

(a): 27–42 N·m (2.7–4.2 kg·m, 20.0–30.0 lb·ft)



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43. Apply A/T fluid to new O-ring and install it to speed sensor and then install speed sensor to adapter case.



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44. After turning manual shift shaft fully rearward, turn it back by 2 notches and set it to "N" range. Then install shift switch, lock washer and set nut and tighten set nut. After tightening it, bend claws of lock washer.

Tightening Torque

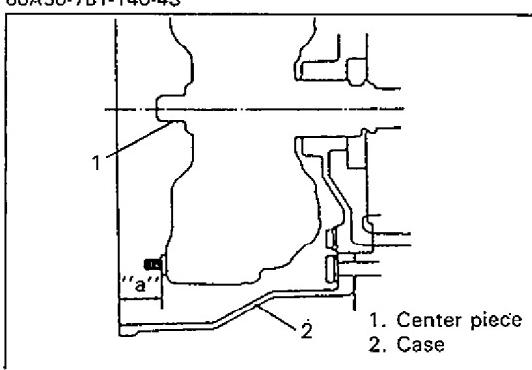
(a): 3–5 N·m (0.3–0.5 kg·m, 2.5–3.5 lb·ft)

45. With neutral reference line and cut groove in switch aligned, tighten lock bolt.

Tightening Torque

(b): 4–7 N·m (0.4–0.7 kg·m, 3.0–5.0 lb·ft)

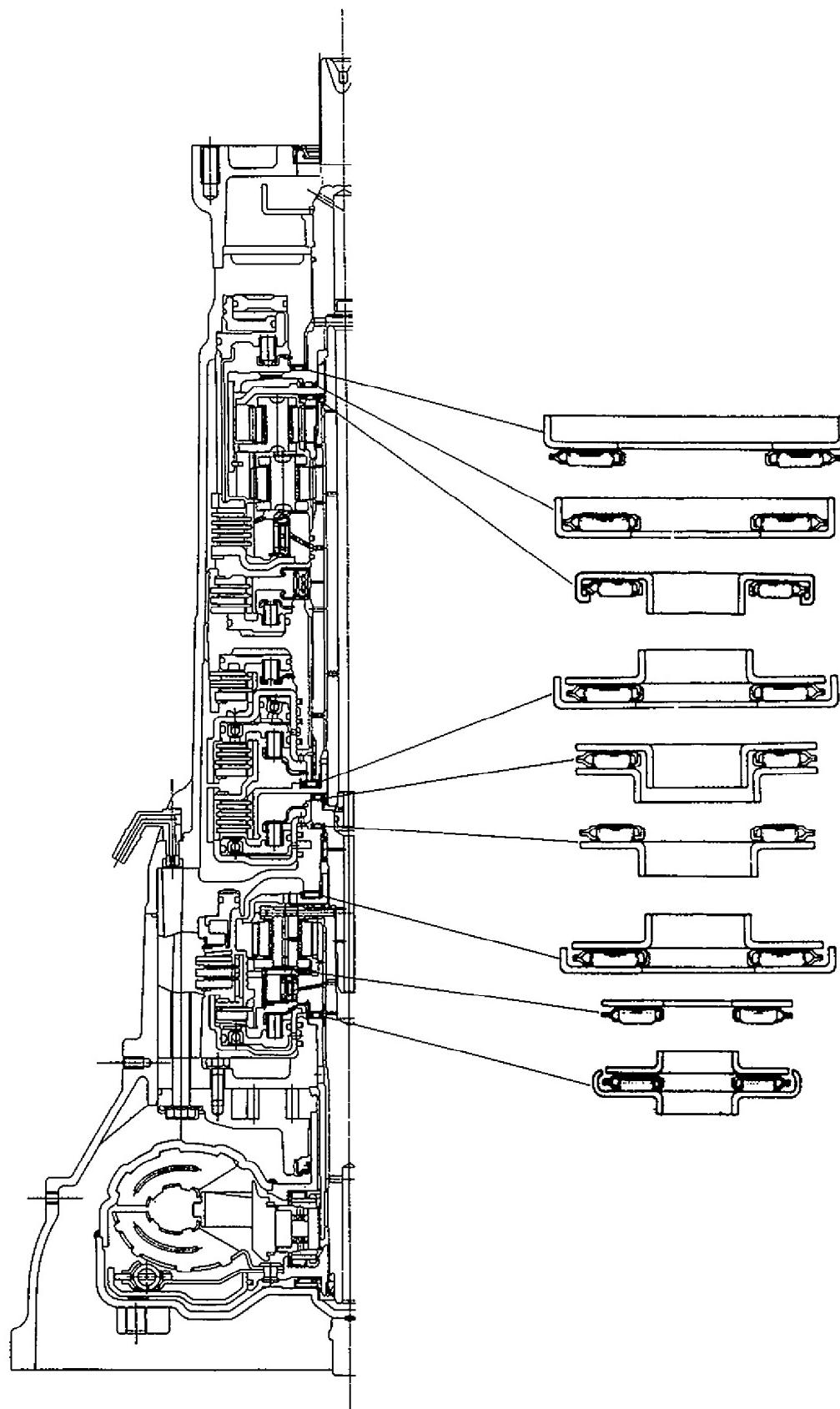
46. Confirm that torque converter is fully fitted in transmission. Confirmation can be done by measuring dimension between end surface of case housing and drive plate installation seat ("a" in figure).

Standard dimension "a": 17 mm or more

60A50-7B1-140-5S

47. Check that torque converter turns smoothly and apply grease to center piece of torque converter.

BEARING AND RACE INSTALLATION DIAGRAM



RECOMMENDED TORQUE SPECIFICATIONS

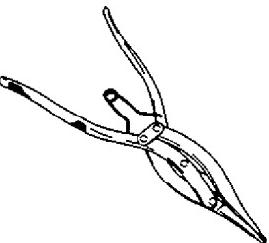
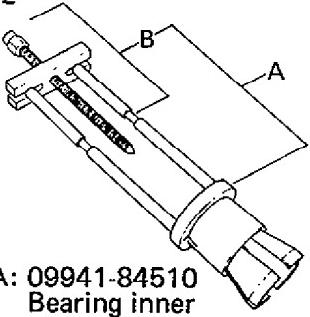
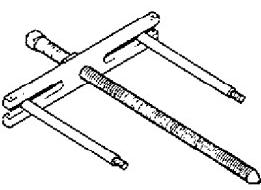
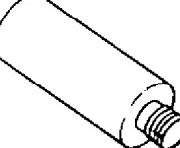
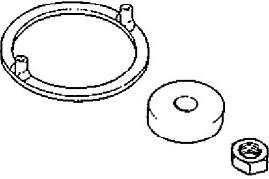
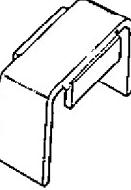
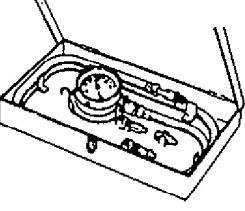
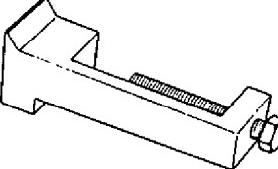
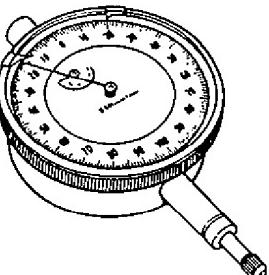
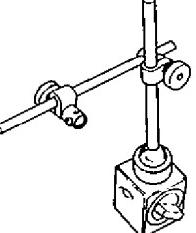
Fastening portion		Tightening torque		
		N·m	kg·m	lb·ft
ON VEHICLE SERVICE MOUNTING	1. Automatic transmission fluid drain plug	18–27	1.8–2.7	13.5–19.5
	2. Transfer oil filler/level and drain plugs	18–28	1.8–2.8	13.5–20.0
	3. Transmission case plug	15–18	1.5–1.8	11.0–13.0
	4. Oil hose clamp bolt	22–35	2.2–3.5	16.0–25.0
	1. Transmission to engine bolts and nuts	70–100	7.0–10.0	51.0–72.0
	2. Engine rear mounting bracket bolts			
	3. Engine rear mounting bolts			
	4. Engine rear mounting member bolts			
	5. Torque stopper bush bolt	40–60	4.0–6.0	29.0–43.0
	6. Torque stopper bracket bolts			
TRANSMISSION INTERNAL	7. Torque stopper member bolts			
	8. Transmission case right/left stiffener bolts			
	9. Muffler to exhaust pipe bolts			
	10. Exhaust pipe bracket bolts			
	11. Exhaust pipe to manifold nuts	50–70	5.0–7.0	36.5–50.5
	12. Universal joint flange bolts and nuts	50–60	5.0–6.0	36.5–43.0
	13. Torque converter mounting bolts	60–70	6.0–7.0	43.5–50.5
	14. Select cable bracket bolts	18–28	1.8–2.8	13.5–20.0
	1. Oil pump bolts	6–9	0.6–0.9	4.5–6.5
	2. Upper/Lower valve body bolts			
EXTERNAL	3. Detent spring bolt	5–6	0.5–0.6	3.7–4.3
	4. Throttle cam bolt	6–9	0.6–0.9	4.5–6.5
	5. Pressure relief valve bolts			
	6. Rear upper valve body plate	5–6	0.5–0.6	3.7–4.3
	7. Solenoid No.1 (Shift solenoid) bolts	8–12	0.8–1.2	6.0–8.5
	8. Solenoid No.2 (Lock-up solenoid) bolts			
	9. Pressure relief valve bolt	5–6	0.5–0.6	3.7–4.3
	10. Lower valve body plate bolts			
	11. Lock-up control valve plates bolts			
	12. Center support bolts	24–28	2.4–2.8	17.5–20.0
	13. Torque converter housing bolts (a)	27–42	2.7–4.2	20.0–30.0
	14. Torque converter housing bolts (b)	48–68	4.8–6.8	35.0–49.0
	15. Parking lock pawl bracket screw	6–9	0.6–0.9	4.5–6.5
	16. Valve body bolts	8–12	0.8–1.2	6.0–8.5
	17. Oil screen bolts	5–6	0.5–0.6	3.7–4.3
	18. Brake applying cover bolts	8–12	0.8–1.2	6.0–8.5
	19. Oil pan bolts	4–5	0.4–0.5	3.0–3.5
	1. Adapter case bolts	27–42	2.7–4.2	20.0–30.0
	2. Manual shift shaft set nut	3–5	0.3–0.5	2.5–3.5
	3. Shift switch lock bolt	4–7	0.4–0.7	3.0–5.0
	4. Oil pipe flare nuts	25–35	2.5–3.5	18.5–25.0
	5. Oil filler tube bolt			
	6. Transfer to transmission bolts	18–28	1.8–2.8	13.5–20.0
	7. Drive plate bolts	75–80	7.5–8.0	54.5–57.5

REQUIRED SERVICE MATERIALS

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
A/T fluid	DEXRON-II (99000-22760)	<ul style="list-style-type: none"> • Automatic transmission • Parts lubrication when installing
Lithium grease	SUZUKI SUPER GREASE C (99000-25030)	<ul style="list-style-type: none"> • Retaining parts in place when assembling • Oil seal lips • Oil pump O ring
	SUZUKI SUPER GREASE A (99000-25010)	<ul style="list-style-type: none"> • Cable ends

60A50-7B1-143-1S

SPECIAL TOOLS

1 	2  A: 09941-84510 Bearing inner remover B: 09926-98390 or Retainer remover	3 	4  09918-48220 Oil pump remover attachment (M8)
5 	6 	7 	8 
9 	10 		
09900-20606 Dial gauge	09900-20701 Magnetic stand		

60A50-7B1-143-2S

SECTION 8

BODY ELECTRICAL SYSTEM

NOTE:

For the items not found in this section of this manual, refer to SECTION 8 of the service manual mentioned in FOREWORD of this manual.

60A50-8-1-1S

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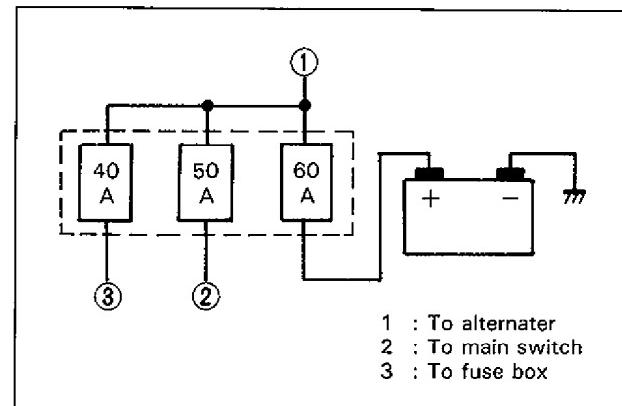
BODY ELECTRICAL SYSTEM

FUSES (EXCEPT FOR GERMAN MARKET)

The main fuse box is located on the fender apron panel in the engine room and the fuse box is installed to underside of the instrument cover panel. The data and arrangement of each fuse are as shown.

60A50-8-2-1S

MAIN FUSE BOX CIRCUIT

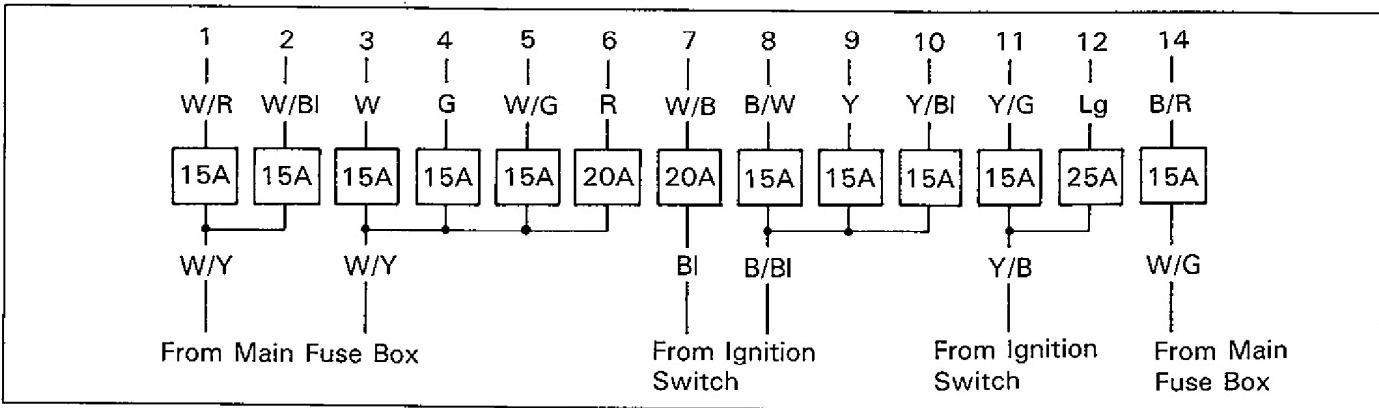


FUSE BOX DESIGNATION

1	2	3	4	5	6	7
15A	15A	15A TAIL DOME	15A STOP HORN	15A HAZARD	20A DOOR LOCK	20A CIGAR RADIO
8	9	10	11	12	13	14
15A IG. COIL METER	15A TURN BACK	15A WIPER WASHER	15A REAR DEFG.	25A HEATER	20A RWAL	15A FI
USE DESIGNATED FUSES ONLY						

60A50-8-2-2S

FUSE CIRCUIT COLOR CODES



60A50-8-2-3S

VEHICLE WIRING COLOR CODES

W/R : White/Red	W/Bl: White/Blue	W : White
G : Green	W/G : White/Green	W/B : White/Black
B/W : Black/White	Y/Bl : Yellow/Blue	Y/G : Yellow/Green
Y : Yellow	Lg : Light green	Bl/Y : Blue/Yellow
W/Y : White/Yellow	Bl : Blue	B/Bl : Black/Blue
Y/B : Yellow/Black	B : Black	R : Red
G/R : Green/Red	B/R : Black/Red	

60A50-8-2-4S

CAUTION:

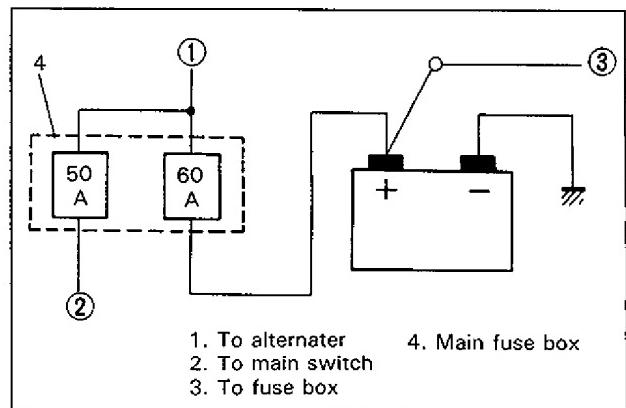
- When replacing a fuse, be sure to use one having a correct rated amperage.
- Before replacing a fuse, turn OFF every switch of electric equipment including main switch.

FUSES (FOR GERMAN MARKET ONLY)

The main fuse box is located on the fender apron panel in the engine room and the fuse box is installed to underside of the instrument cover panel. The data and arrangement of each fuse are as shown.

60A50-8-3-1S

MAIN FUSE BOX CIRCUIT



FUSE BOX DESIGNATION

1	2	3	4	5	6	7
10A	10A	10A DOME	15A STOP HORN	15A HAZARD	15A REAR DEFG.	20A HEATER
HEAD R - L						
8	9	10	11	12	13	14
10A LICENCE	10A TAIL R	10A TAIL L	20A CIGAR RADIO	15A IG. COIL METER	10A TURN BACK	15A WIPER WASHER

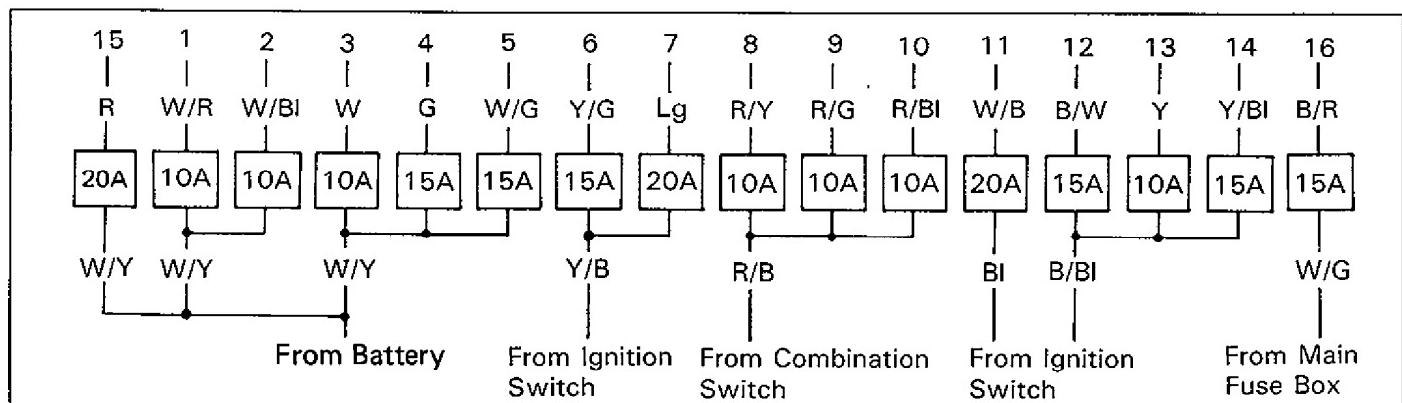
USE DESIGNATED FUSES ONLY

60A50-8-3-2S

16	15A	FI
15	20A	DOOR LOCK

1. Headlight RH
 2. Headlight LH
 3. Dome light
 4. Stop light, horn
 5. Hazard
 6. Rear defogger
 7. Heater
 8. Licence lamp
 9. Tail lamp RH
 10. Tail lamp LH
 11. Cigar lighter, radio
 12. Ignition coil, meter
 13. Turn signal light, back-up light
 14. Wiper, washer
 15. Electronic fuel injection main relay
 16. Door lock controller

FUSE CIRCUIT COLOR CODES



60A50-8-3-3S

VEHICLE WIRING COLOR CODES

W/R : White/Red	W/Bl: White/Blue	W : White
G : Green	W/G: White/Green	W/B : White/Black
B/W : Black/White	Y/Bl : Yellow/Blue	Y/G : Yellow/Green
Y : Yellow	Lg : Light green	Bl/Y : Blue/Yellow
W/Y : White/Yellow	Bl : Blue	B/Bl : Black/Blue
Y/B : Yellow/Black	B : Black	R : Red
G/R : Green/Red	B/R : Black/Red	

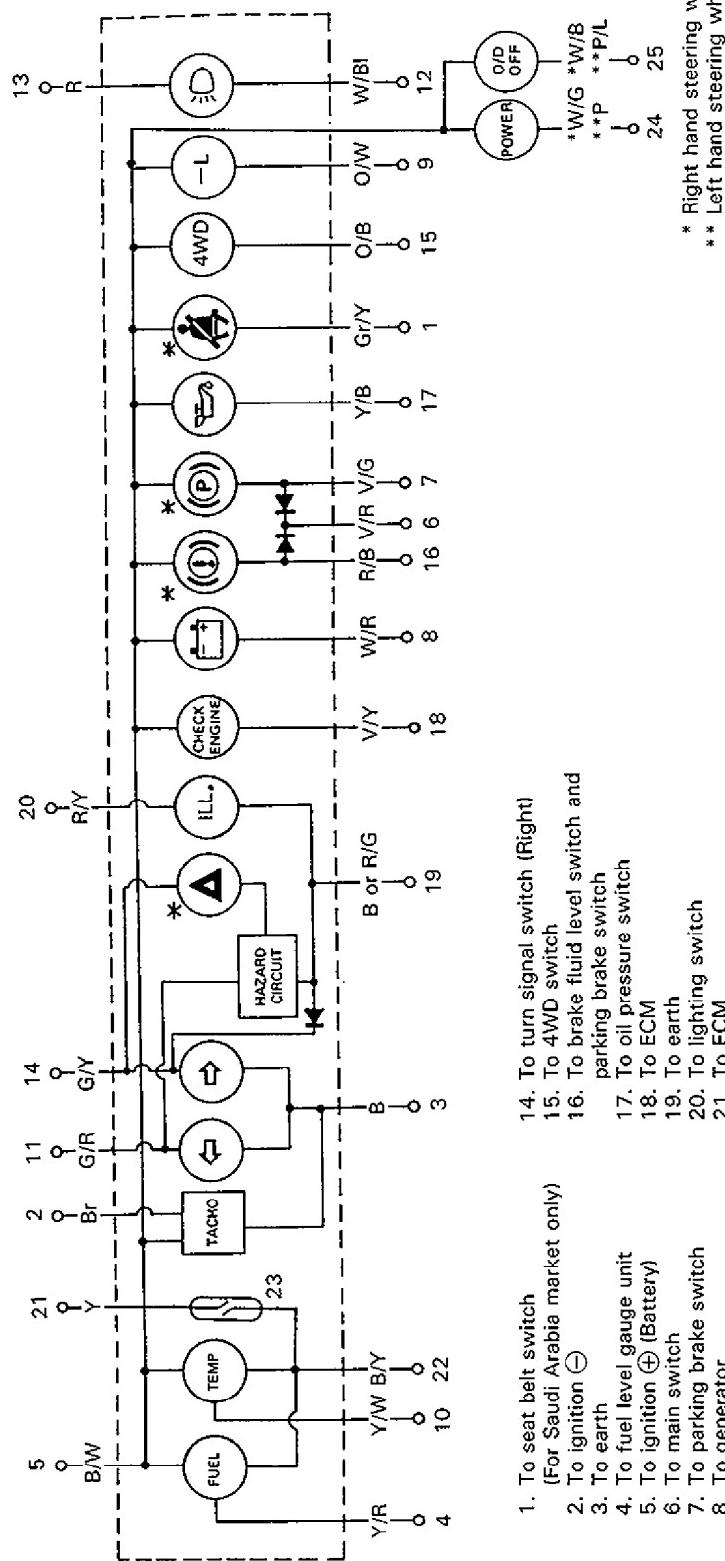
60A50-8-3-4S

CAUTION:

- When replacing a fuse, be sure to use one having a correct rated amperage.
 - Before replacing a fuse, turn OFF every switch of electric equipment including main switch.

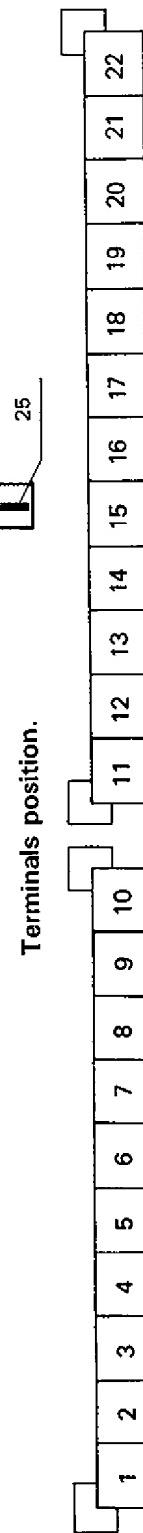
INSTRUMENTS AND GAUGES

COMBINATION METER WIRING



- NOTE:
Whether equipped with * marked parts or not
depends on vehicle specifications.
1. To seat belt switch (Right)
(For Saudi Arabia market only)
 2. To ignition (E)
 3. To earth
 4. To fuel level gauge unit
 5. To ignition (Battery)
 6. To main switch
 7. To parking brake switch
 8. To generator
 9. To 4WD low switch
 10. To water temperature gauge unit
 11. To turn signal switch (Left)
 12. To battery (Fuse box)
 13. To dimmer & passing switch
 14. To turn signal switch (Right)
 15. To 4WD switch
 16. To brake fluid level switch and parking brake switch
 17. To oil pressure switch
 18. To ECM
 19. To earth
 20. To lighting switch
 21. To ECM
 22. To earth
 23. Speed sensor
 24. To A/T controller (A/T model)
 25. To A/T controller (A/T model)

Terminals position.



TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Fuel level meter shows no operation.	<ul style="list-style-type: none"> • Meter fuse blown • Fuel meter faulty • Fuel level gauge unit faulty • Wiring or grounding faulty 	<p>Replace fuse to check for short. Check meter. Check gauge unit. Repair.</p>
Water temperature meter shows no operation.	<ul style="list-style-type: none"> • Meter fuse blown • Water temperature meter faulty • Sater temperature gauge unit faulty • Wiring or grounding faulty 	<p>Replace fuse to check for short. Check meter. Check gauge unit. Repair.</p>
Oil pressure light shows no lighting.	<ul style="list-style-type: none"> • Light fuse blown • Bulb burnt out • Oil pressure switch faulty • Wiring or grounding faulty 	<p>Replace fuse to check for short. Replace bulb. Check switch. Repair.</p>
Brake fluid level warning light (parking brake light) shows no lighting.	<ul style="list-style-type: none"> • Light fuse blown • Bulb burnt out • Brake fluid level switch faulty • Wiring or grounding faulty 	<p>Replace fuse to check for short. Replace bulb. Check warning switch. Repair.</p>
Seat belt warning light buzzer show no lighting/sounding. <i>Applicable to vehicle equipped with light/buzzer</i>	<ul style="list-style-type: none"> • Light fuse blown • Bulb burnt out • Buzzer faulty (no sounding) • Wiring or grounding faulty 	<p>Replace fuse to check for short. Replace bulb. Replace buzzer. Repair.</p>
Headlight warning buzzer shows no sounding. <i>Applicable to vehicle equipped with light/buzzer</i>	<ul style="list-style-type: none"> • Buzzer fuse blown • Buzzer faulty • Wiring or grounding faulty 	<p>Replace fuse to check for short. Replace buzzer. Repair.</p>

60A50-8-5-1S

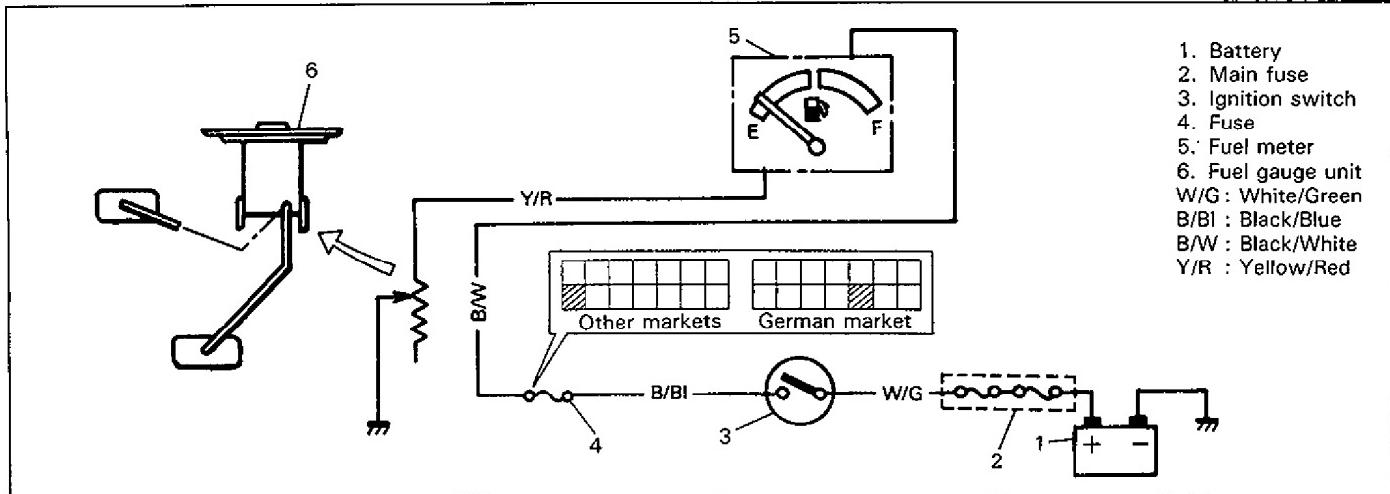
FUEL METER/FUEL GAUGE UNIT

Description of Circuit

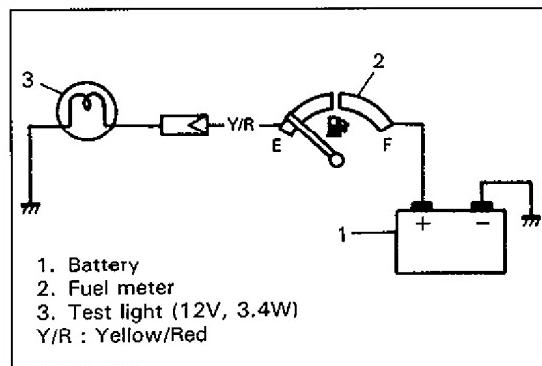
The fuel meter circuit consists of the fuel meter and the fuel gauge unit in the tank. Current flowing through the meter coil is varied to control the movement of the meter pointer.

60A50-8-5-2S

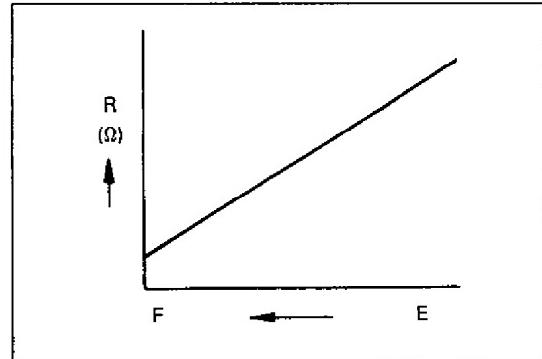
When the tank is full, the fuel level gauge resistance is decreased allowing more current flow into the meter coil causing the pointer to move the "F" (FULL) position.



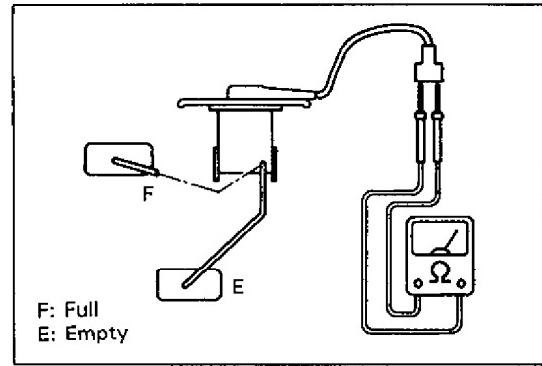
60A50-8-6-1S



60A50-8-6-2S



60A50-8-6-3S



60A50-8-6-4S

Inspection

FUEL METER

1. Remove rear bumper.
2. Disconnect Y/R (Yellow/Red) lead wire going to gauge unit.
3. Use bulb (12V 3.4W) in positionn to ground above lead wire as shown.
4. Turn main switch ON.
5. Make sure bulb is lighted with meter pointer fluctuating several seconds thereafter.
6. If meter is faulty, replace it.

GAUGE UNIT

Use a ohmmeter to confirm that level gauge unit changes in resistance with the change of float position. Float position-to-resistance relationship can be plotted in a graph as shown.

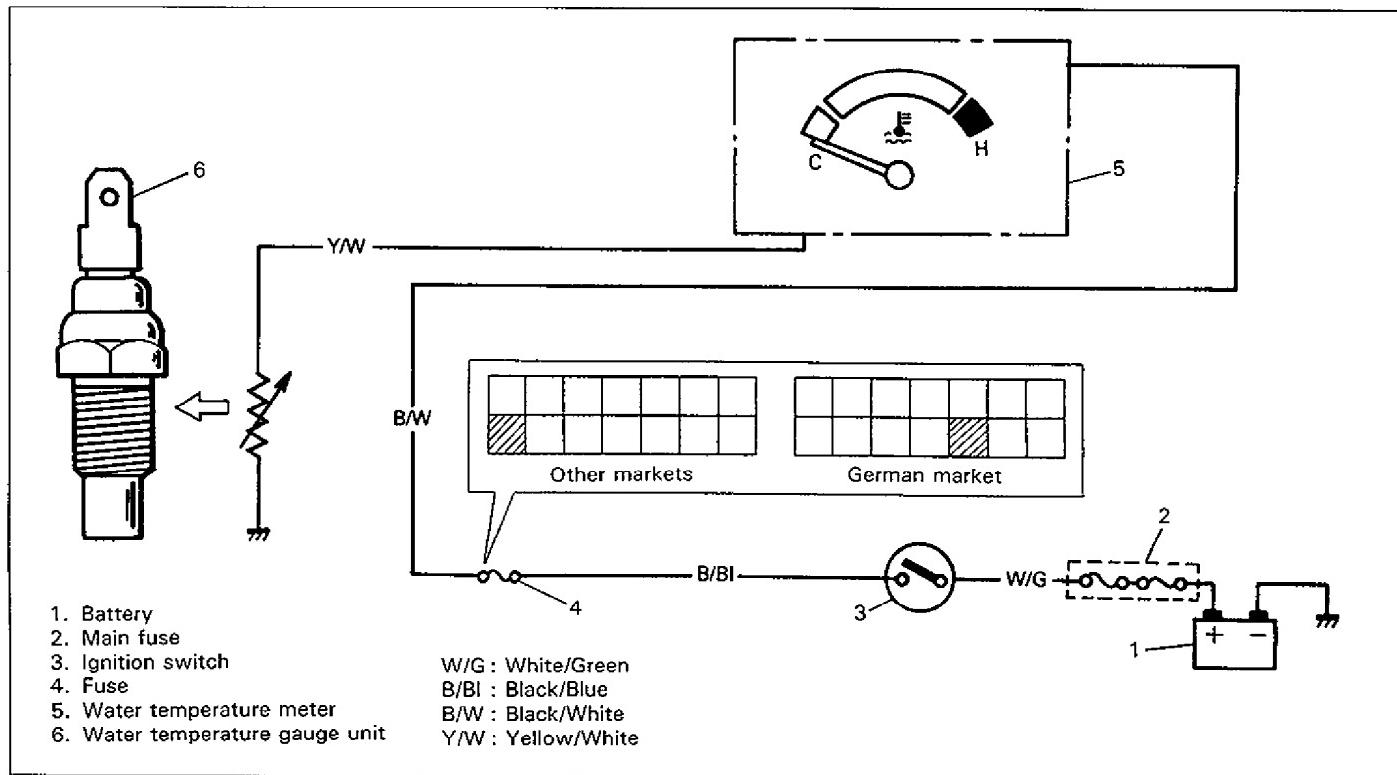
Position	Resistance
E	$120 \pm 7\Omega$
F	$3 \pm 2\Omega$
1/2	$32.5 \pm 4\Omega$

WATER TEMP. METER/GAUGE UNIT

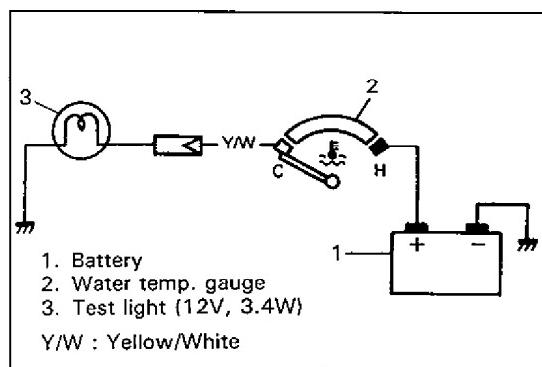
Description of Circuit

The water temperature gauge circuit consists of the temperature gauge installed in the cluster and the gauge unit installed on the intake manifold.

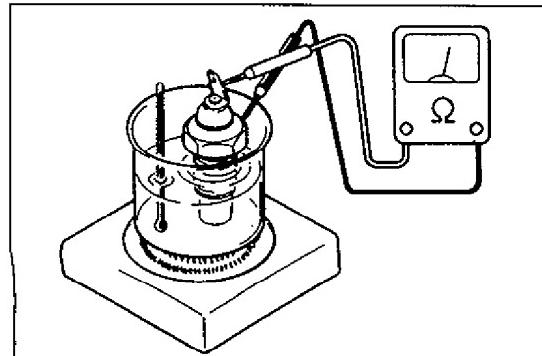
The gauge unit shows different resistance values depending on the coolant temperature. This causes a current flowing through the temperature gauge coil to change, controlling the gauge pointer. That is, when the coolant temperature rises, the gauge unit resistance is decreased with more current flowing through the gauge coil, raising the gauge pointer upward from the "C" position.



60A50-8-7-1S



60A50-8-7-4S



60A50-7-5S

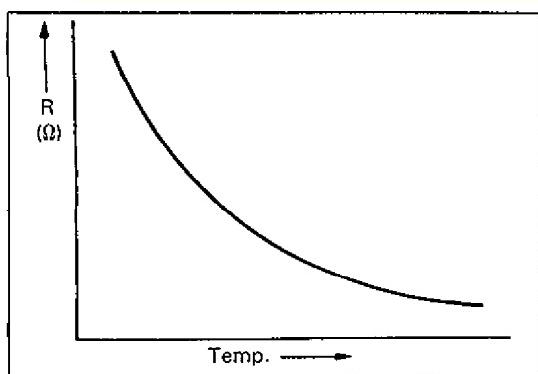
Inspection

WATER TEMP. METER

1. Disconnect Y/W (Yellow/White) lead wire going to gauge unit installed to intake manifold.
2. Use a bulb (12V 3.4W) in position to ground above wire as illustrated.
3. Turn main switch ON. Confirm that bulb is lighted with meter pointer fluctuating several seconds thereafter. If meter is faulty, replace it.

GAUGE UNIT

Warm up gauge unit. Thus make sure its resistance is decreased with increase of its temperature. Temperature and resistance relationship can be plotted in a graph as shown.



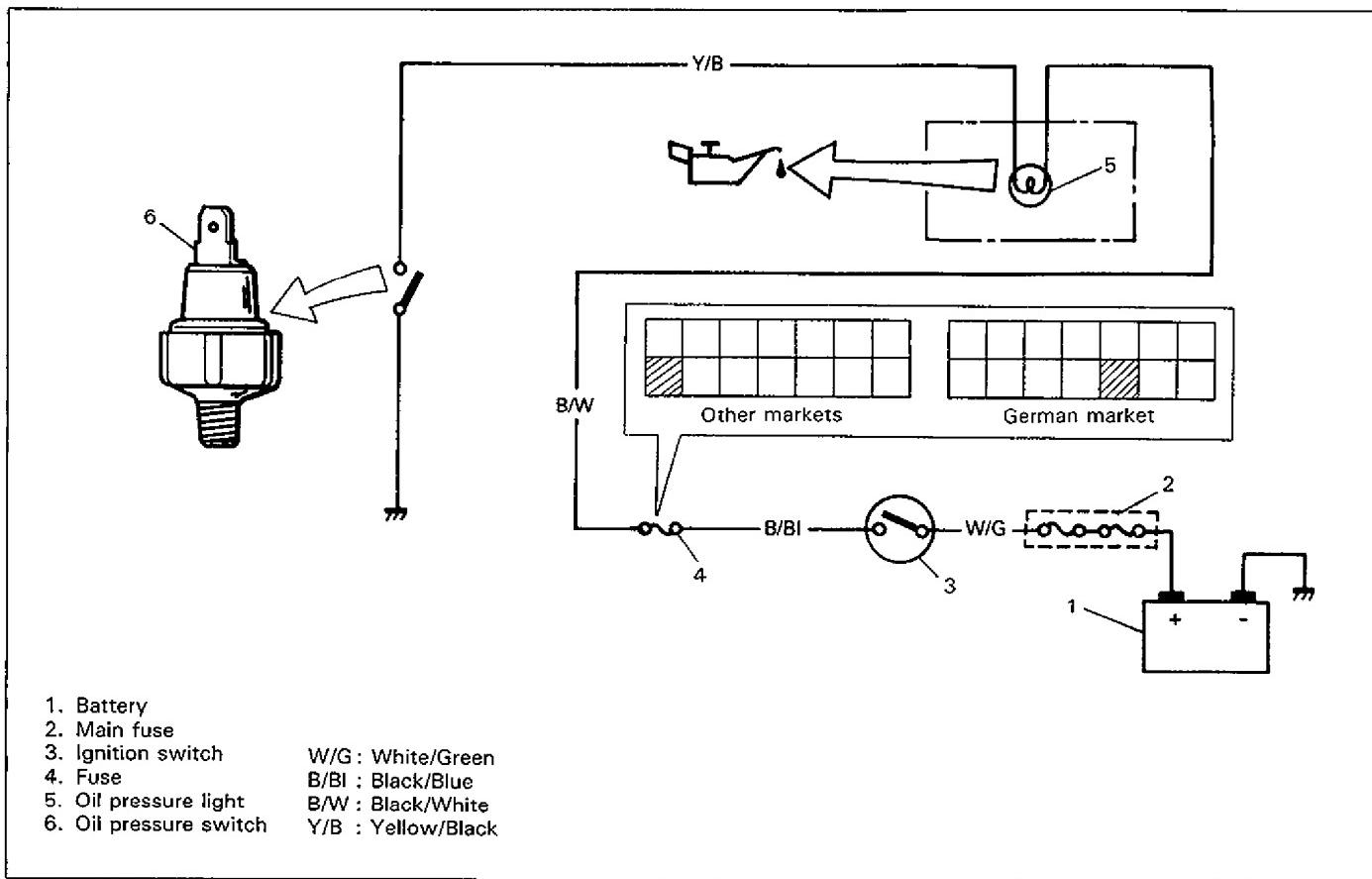
60A50-8-8-1S

Temperature	Resistance
50°C (122°F)	133.9 – 178.9Ω
80°C (176°F)	47.5 – 56.8Ω
100°C (212°F)	26.2 – 29.3Ω

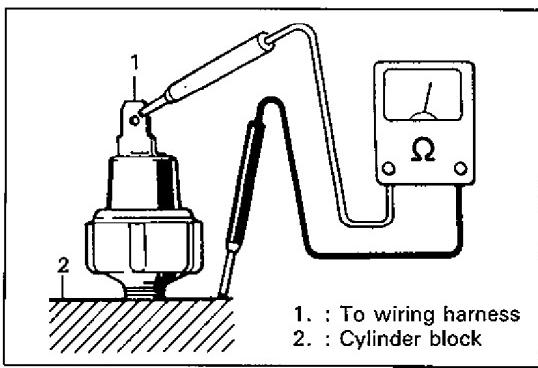
OIL PRESSURE LIGHT

The oil pressure circuit consists of the oil pressure switch installed to the cylinder block and the light (warning light) inside the combination meter.

It operates in such a way that it is switched OFF when oil pressure is produced by the started engine and then fed to switch.



60A50-8-8-2S



60A50-8-8-5S

Inspection

OIL PRESSURE SWITCH

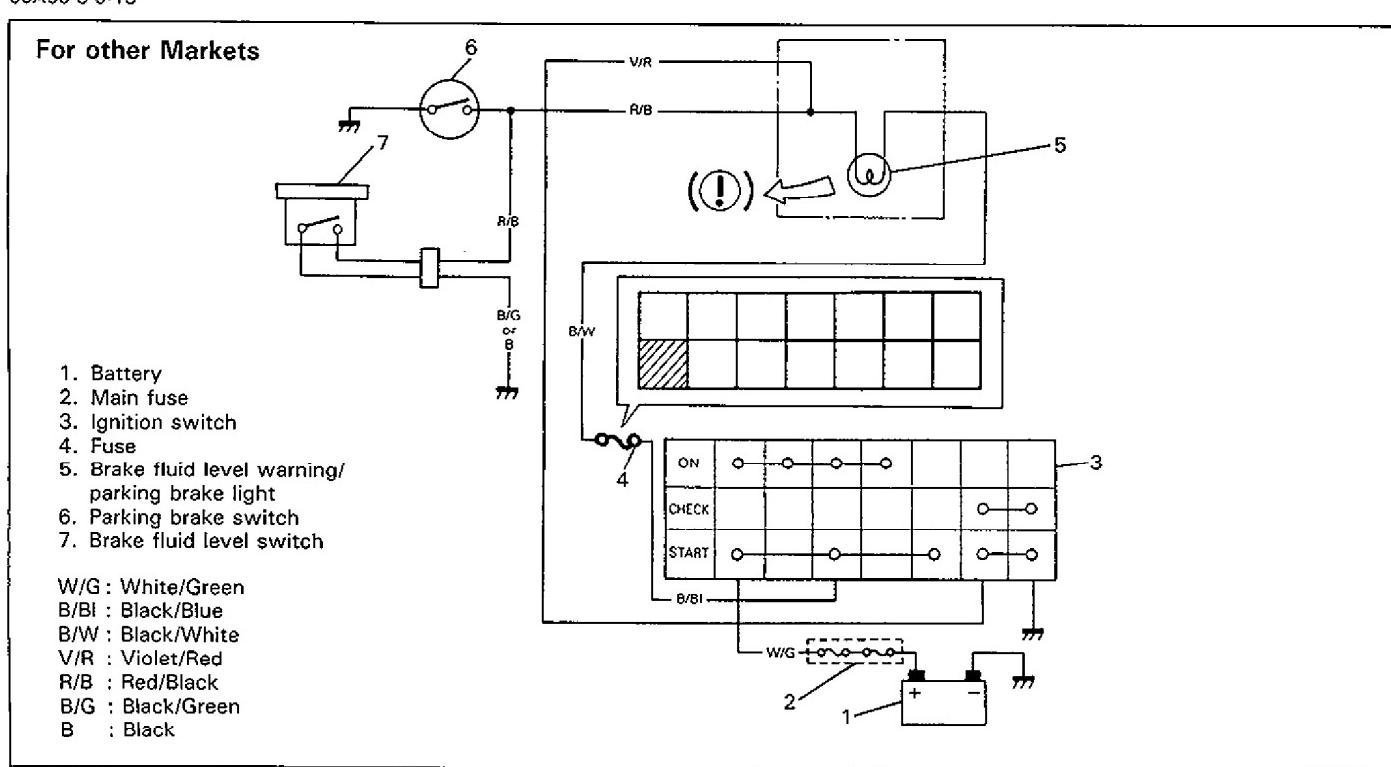
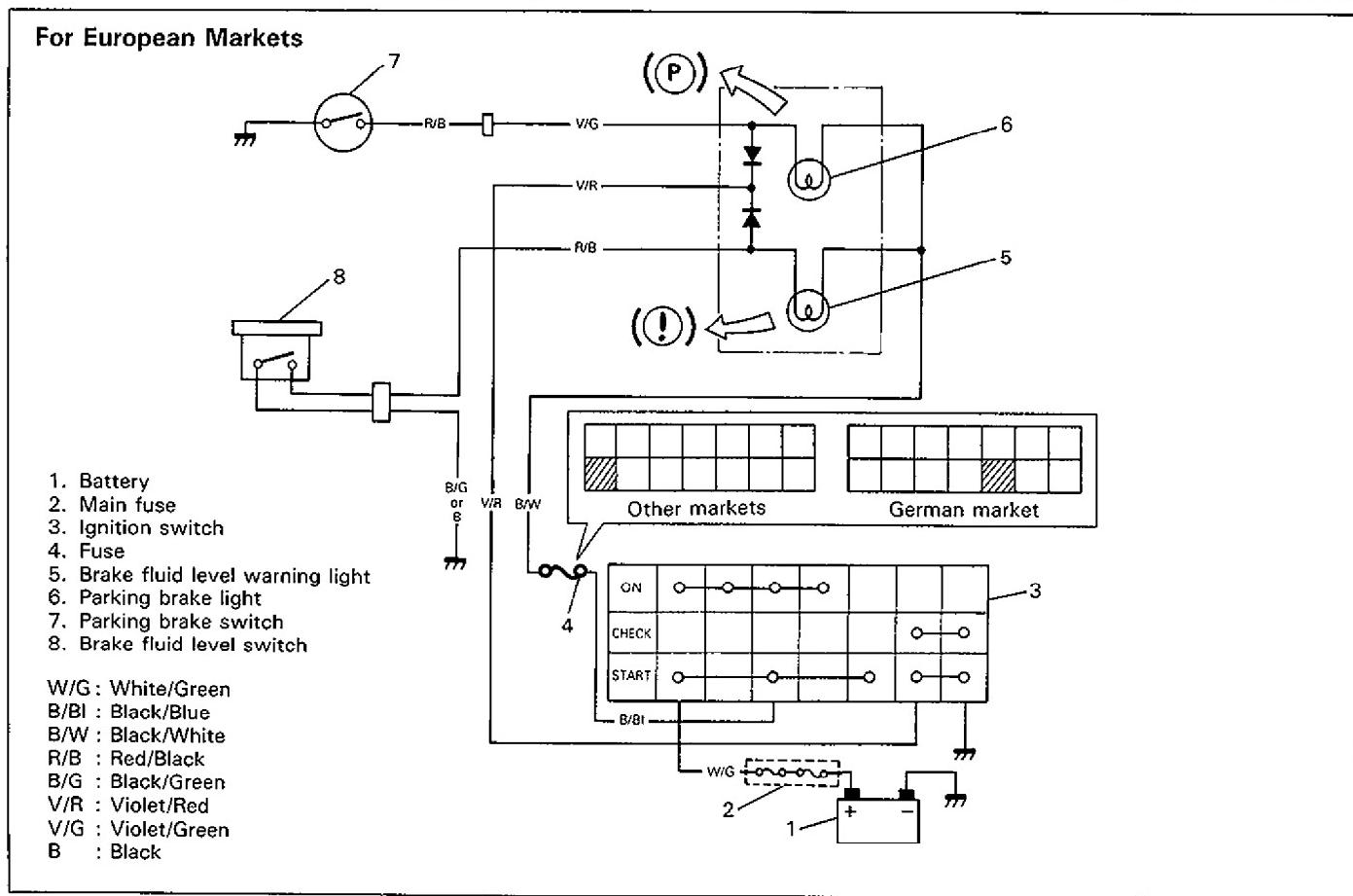
Use a ohmmeter to check switch continuity.

During Engine Running	No continuity obtained ($\infty\Omega$)
At Engine Stop	Continuity obtained (0Ω)

BRAKE FLUID LEVEL AND PARKING BRAKE WARNING LIGHTS

Description of Circuit

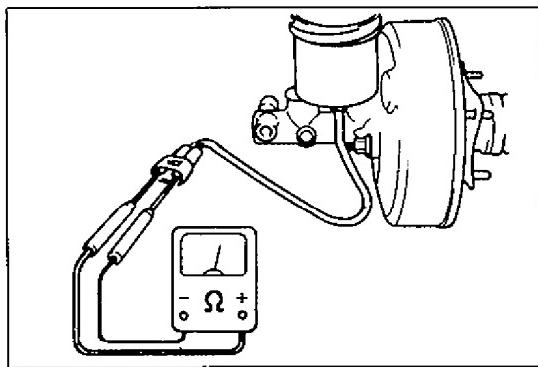
The brake fluid level warning light circuit consists of a brake fluid level switch installed in the master cylinder reservoir, and the light (brake fluid level warning light) in the gauge cluster. Also, this circuit is additionally provided with the parking brake switch which warns that the parking brake is applied.



Operation of Warning Light

1. When the engine is stopped the warning light comes on, if the ignition switch is turned ON and the parking brake is applied.
2. For the bulb check, the warning light comes on briefly during engine starting regardless of the brake fluid level position and the parking brake operation.
3. After the engine is started, release the parking brake. If the light goes off, the brake fluid level is adequate.

60A50-8-10-1S



60A50-8-10-2S

Inspection

BRAKE FLUID LEVEL SWITCH

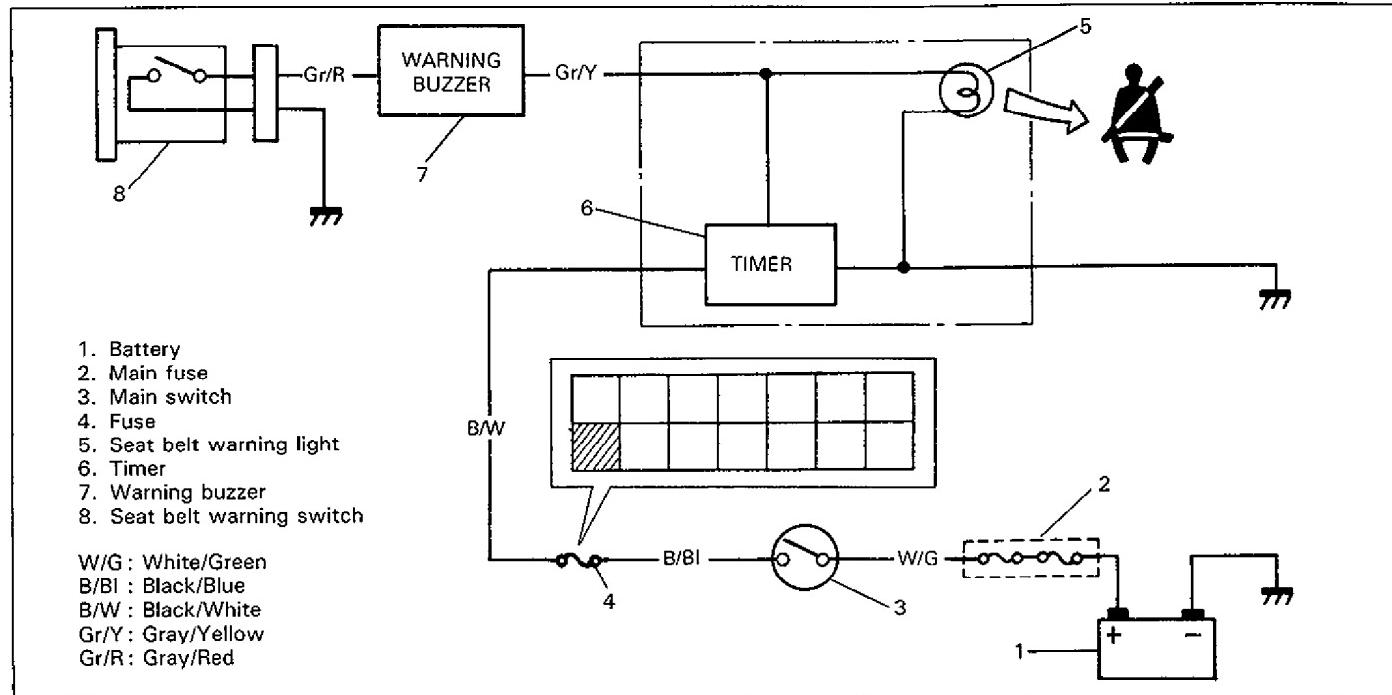
Use an ohmmeter to check switch for continuity. If found defective, replace switch.

OFF position (float up)	No continuity
ON position (float down)	Continuity

SEAT BELT WARNING LIGHT/BUZZER (For Saudi Arabia market)

Description of Circuit

The seat belt warning light/buzzer circuit is a system to light and sound the light and buzzer respectively for several seconds, urging the driver to wear his seat belt. After several seconds passed, the light goes OFF and the buzzer stops sounding whether the seat belt is worn or not.



60A50-8-10-3S

Inspection

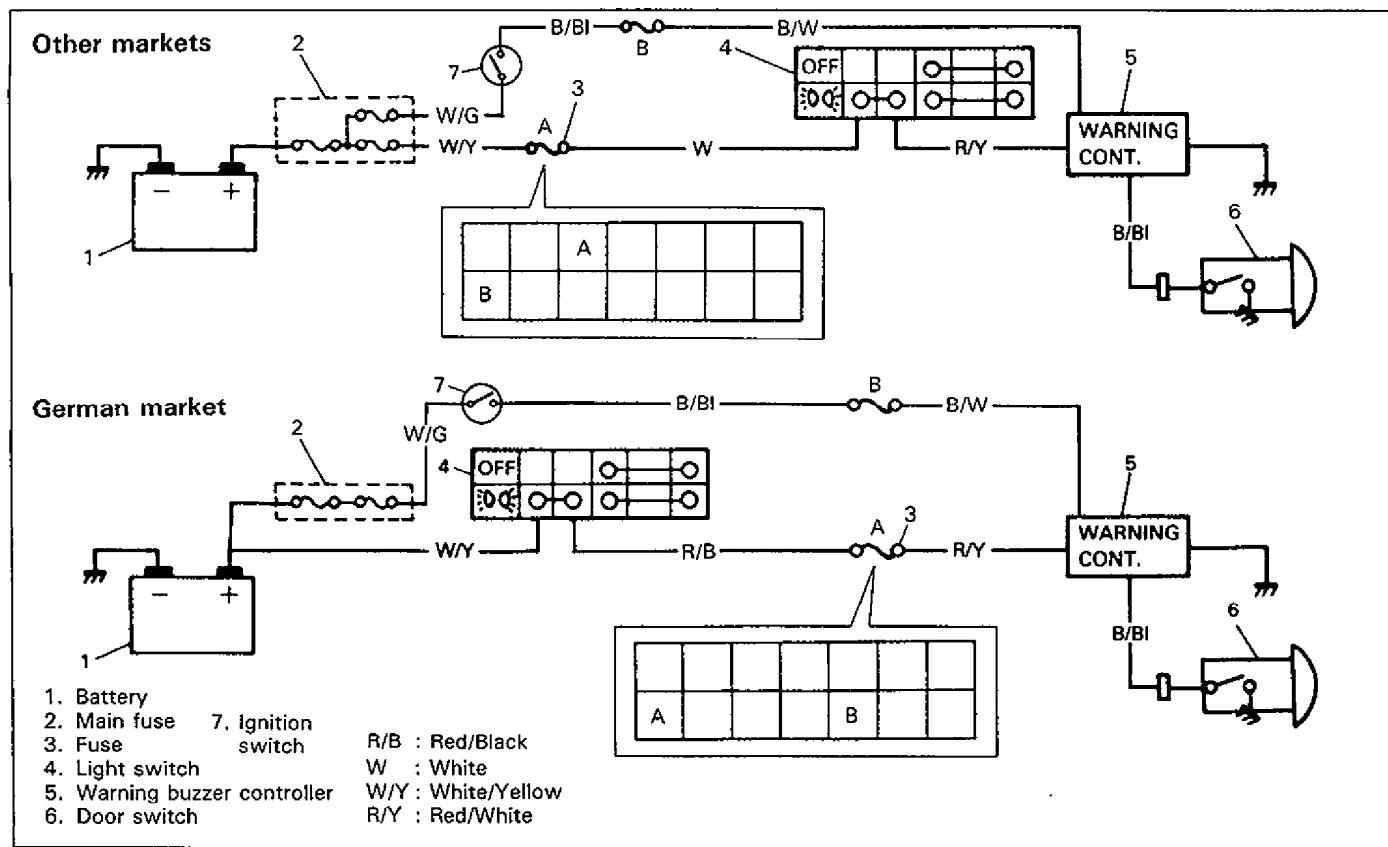
When warning light/buzzer do not make lighting/sounding, use above Circuit Diagram as reference to check bulb, buzzer, wiring etc.

60A50-8-9-4S

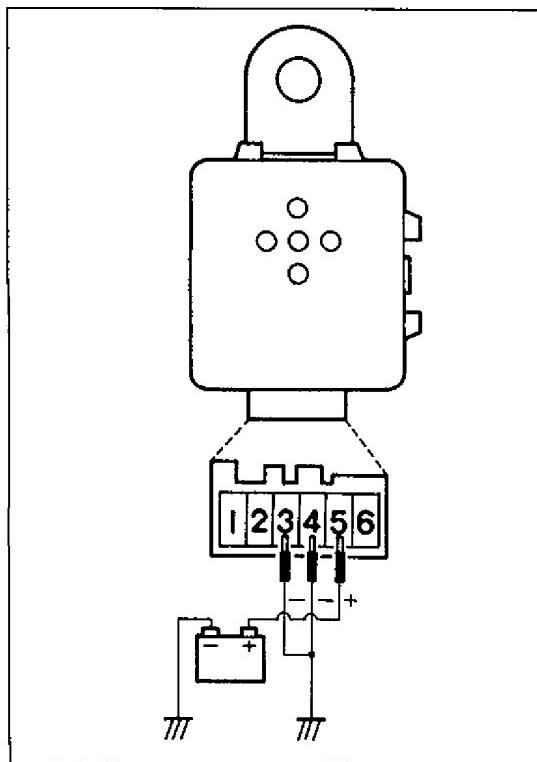
LIGHT WARNING BUZZER

Description of Circuit

The light warning buzzer circuit is a system to sound the buzzer when ignition switch turns OFF and door switch (driver's side) turns ON (i.e. driver's side door opens) while lighting switch turns still ON, warning driver to turn off the lights.



60A50-8-11-1S



60A50-8-11-2S

Inspection

When the warning buzzer does not make sounding, use the above circuit diagram as reference to check the buzzer, wiring, etc.

INSPECTION OF WARNING CONTROLLER

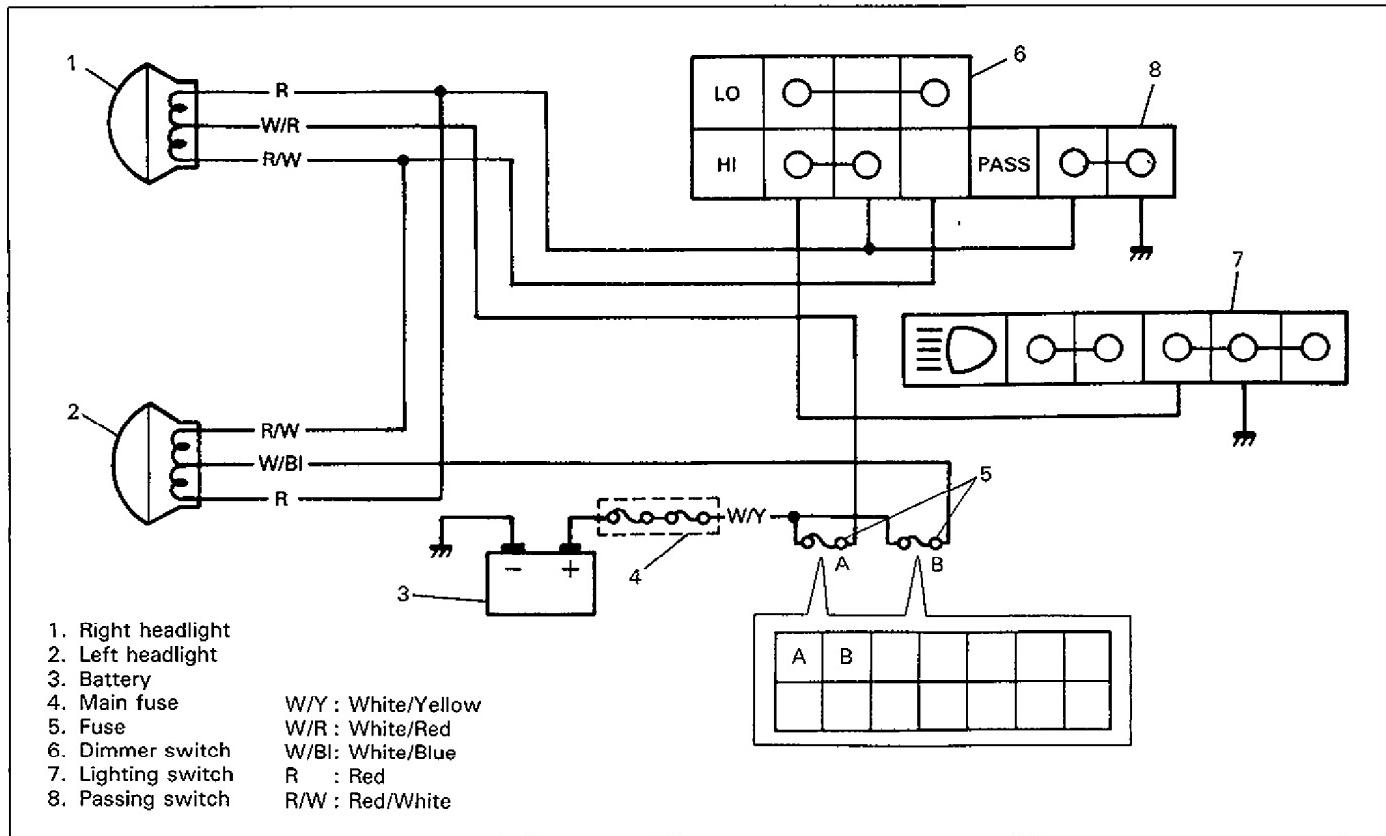
First, connect positive (+) terminal of battery to terminal ⑤ of controller and negative (-) one to ③ and ④. If buzzer emits buzzing sound then, controller is in good condition. If not, replace.

ON VEHICLE SERVICE

LIGHTING SYSTEM

HEADLIGHTS

Wiring Diagram



When the headlights are turned on, so is the small light system. As for the circuit of the small light system, refer to the following pages.

60A50-8-12-1S

Trouble Diagnosis

Trouble	Possible cause	Correction
Only one light does not light.	<ul style="list-style-type: none"> Bulb burnt out Fuse blown Socket, wiring or grounding faulty 	Replace light. Replace fuse. Repair as necessary.
Headlights do not light.	<ul style="list-style-type: none"> Main fuse and/or fuses blown Lighting and dimmer switches faulty Wiring or grounding faulty 	Replace main fuse and/or fuses to check for short. Check switches. Repair as necessary.
Only one beam ("Hi" or "Lo") does not light.	Lighting or dimmer switch faulty	Check switch.

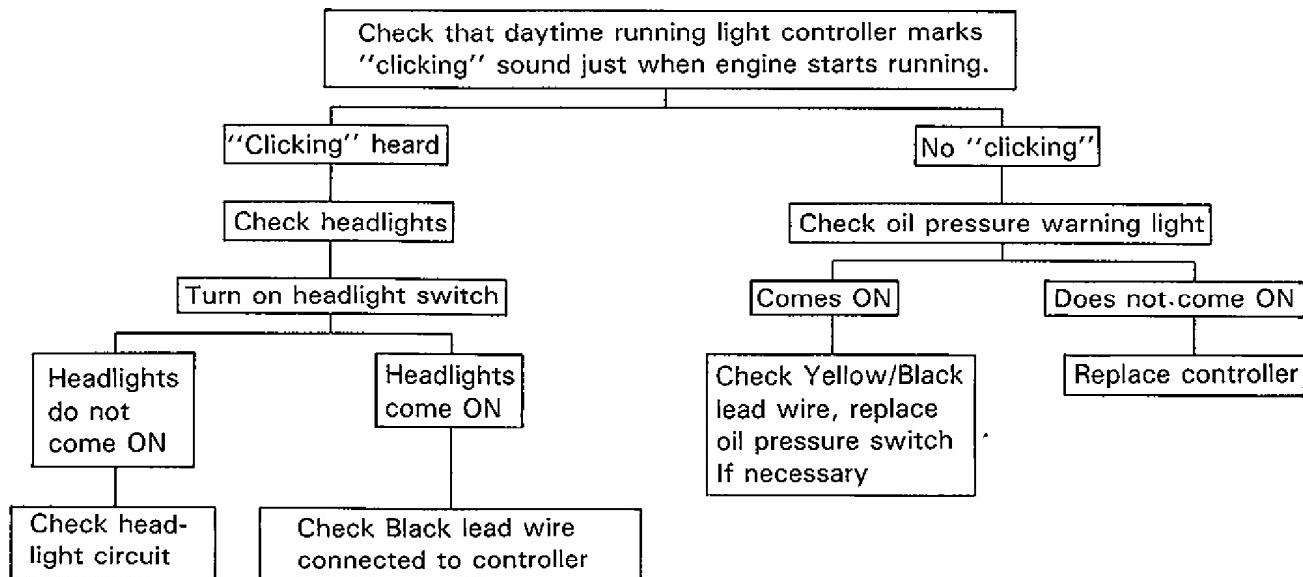
60A50-8-12-2S

DAYTIME RUNNING LIGHT SYSTEM (For Norwegian and Finnish markets)

With this system, low beam of headlights and small lights turn ON when the engine is started and they turn OFF when it is stopped.

This system is so designed that the lighting switch has a priority. That is, when the lighting switch is set to the small light position while the engine is running and this system is at work (headlights and small lights are ON), only small lights remain ON and headlights turn OFF.

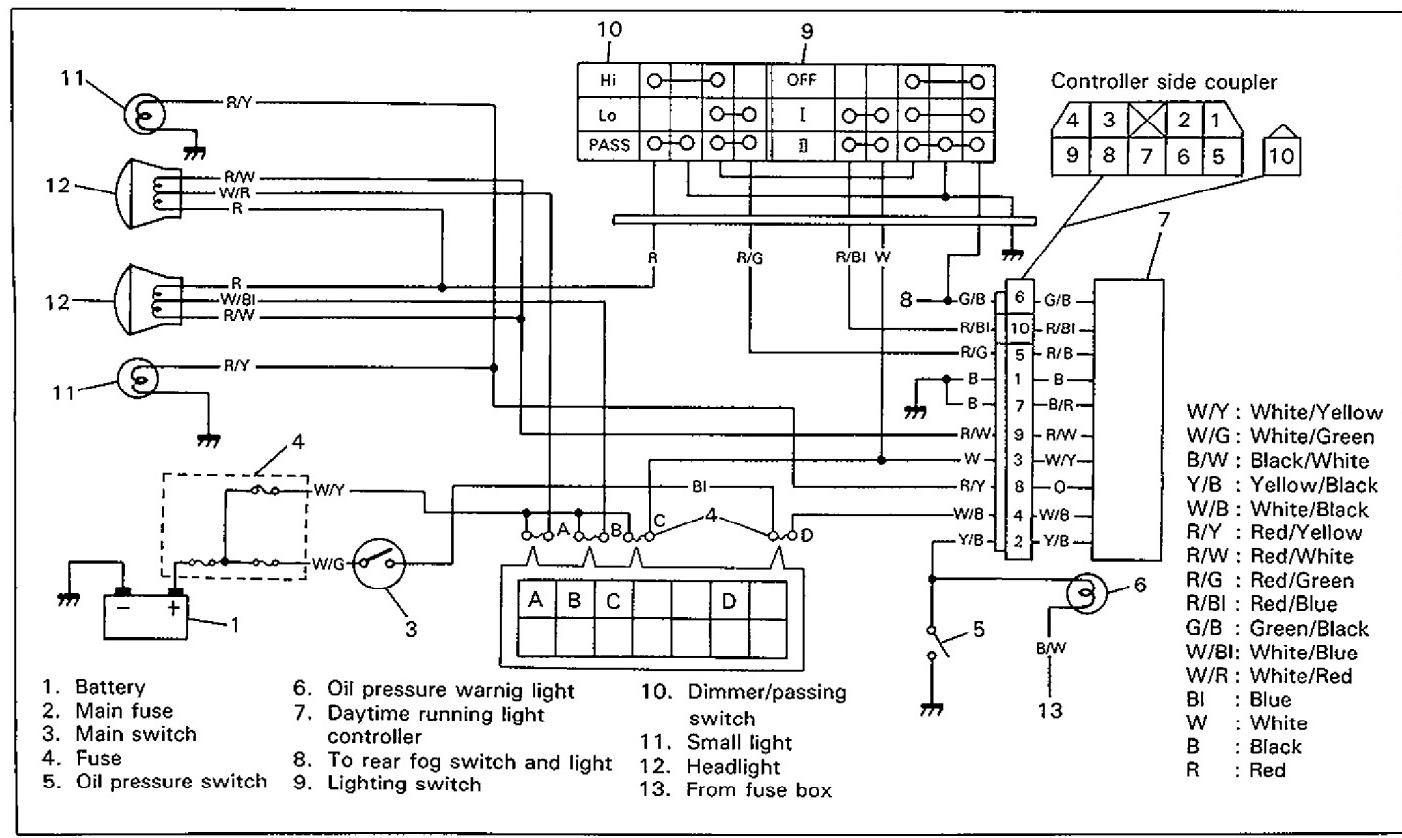
When a trouble has occurred in this system, check and correct it according to the following flow chart.



NOTE:

Daytime running light controller is located under instrument panel at the right of steering column.

60A50-8-13-1S



60A50-8-13-2S

DIM-DIP SYSTEM (For England only)

Role of this system is to dim out low beam of headlights which light when engine is started and lighting switch is set to small light position.

Should anything go wrong with this system, check controller by measuring D.C. voltage between Red/White lead (headlight low beam side) and ground as shown by broken line in figure below with engine running and lighting switch set to small light position.

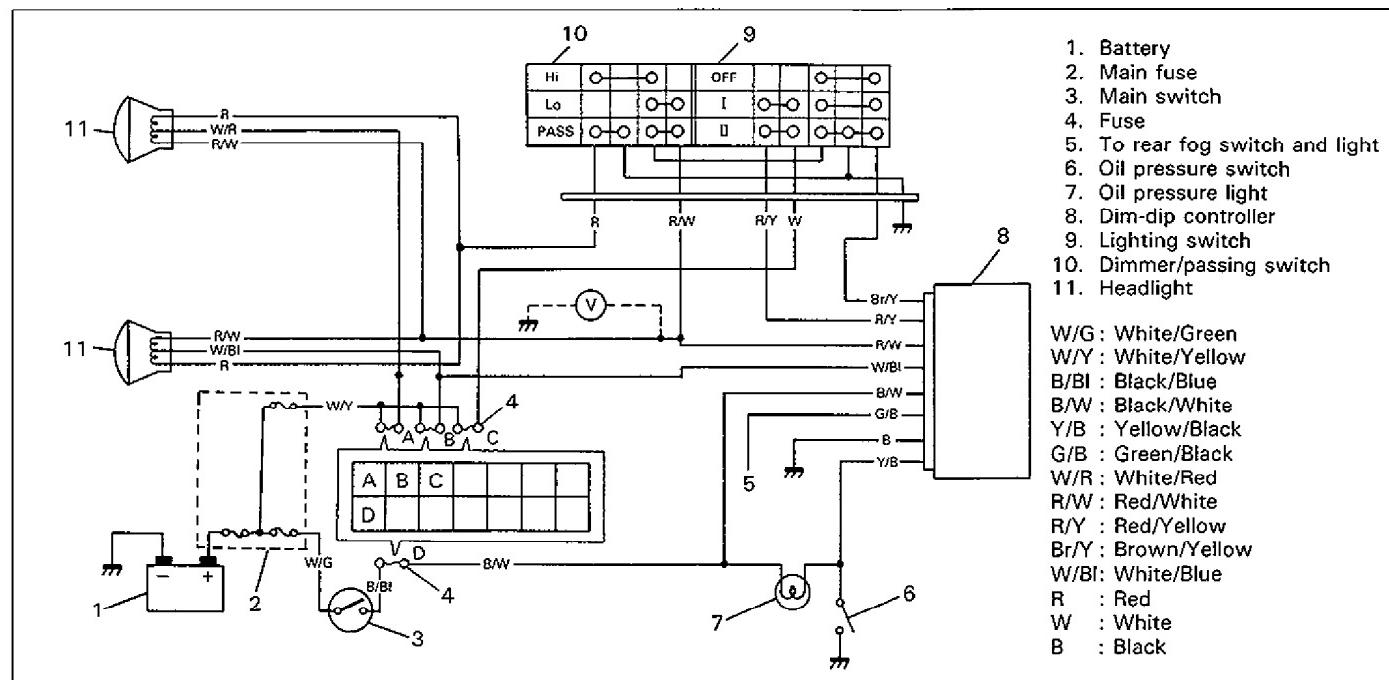
If measured voltage is out of specification (about 6V), replace controller.

If controller is in good condition (i.e., measured voltage is about 6V), check wiring, etc. while referring to below circuit diagram.

If headlights remain on even when engine is at a stop and lighting switch is turned OFF, replace controller.

NOTE:

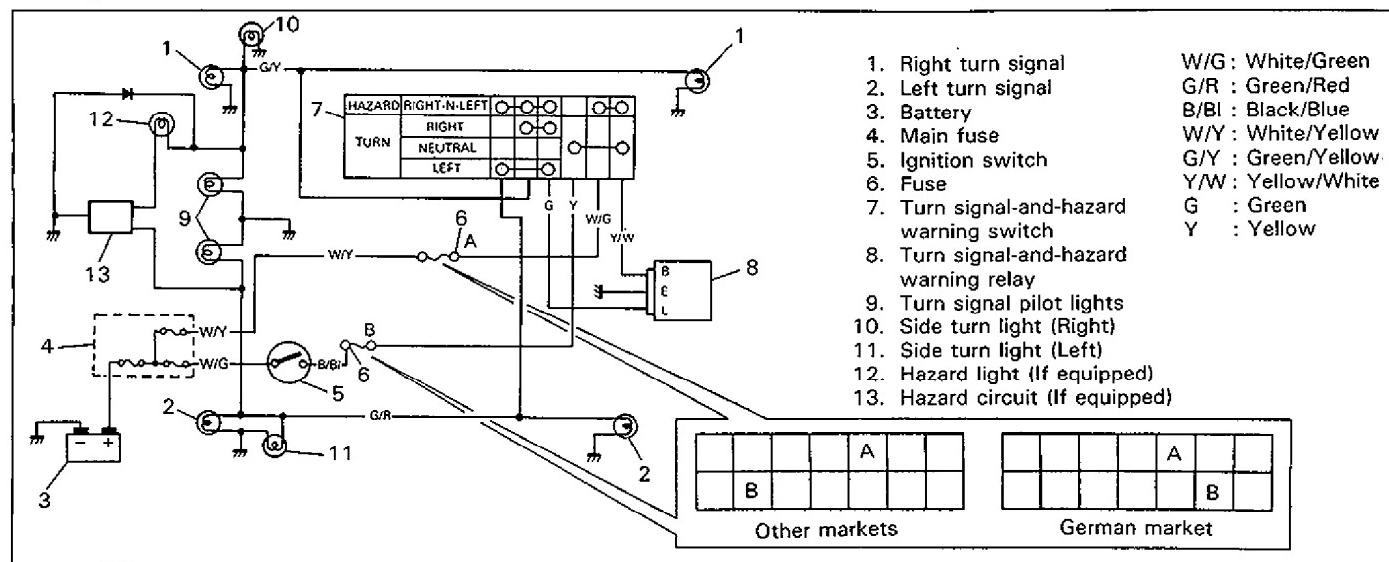
Dim-dip controller is located under instrument panel at the right of steering column.



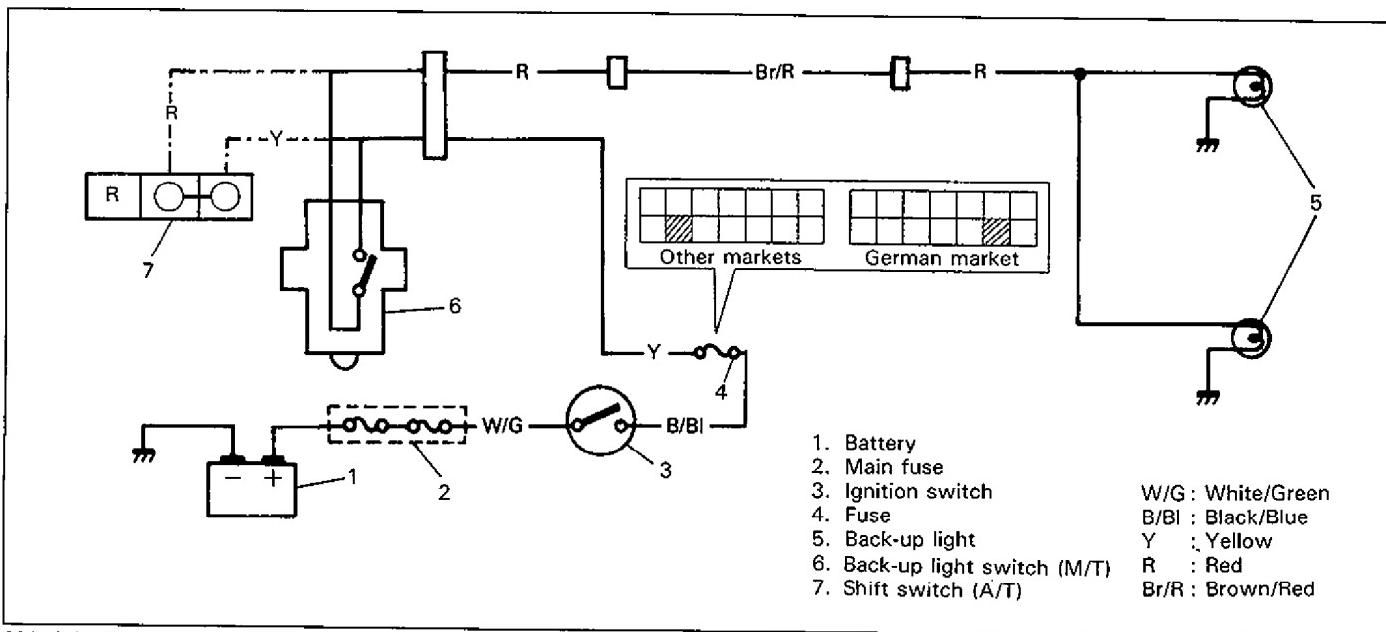
60A50-8-14-1S

TURN SIGNAL AND HAZARD WARNING LIGHT

Wiring Circuit



60A50-8-14-2S

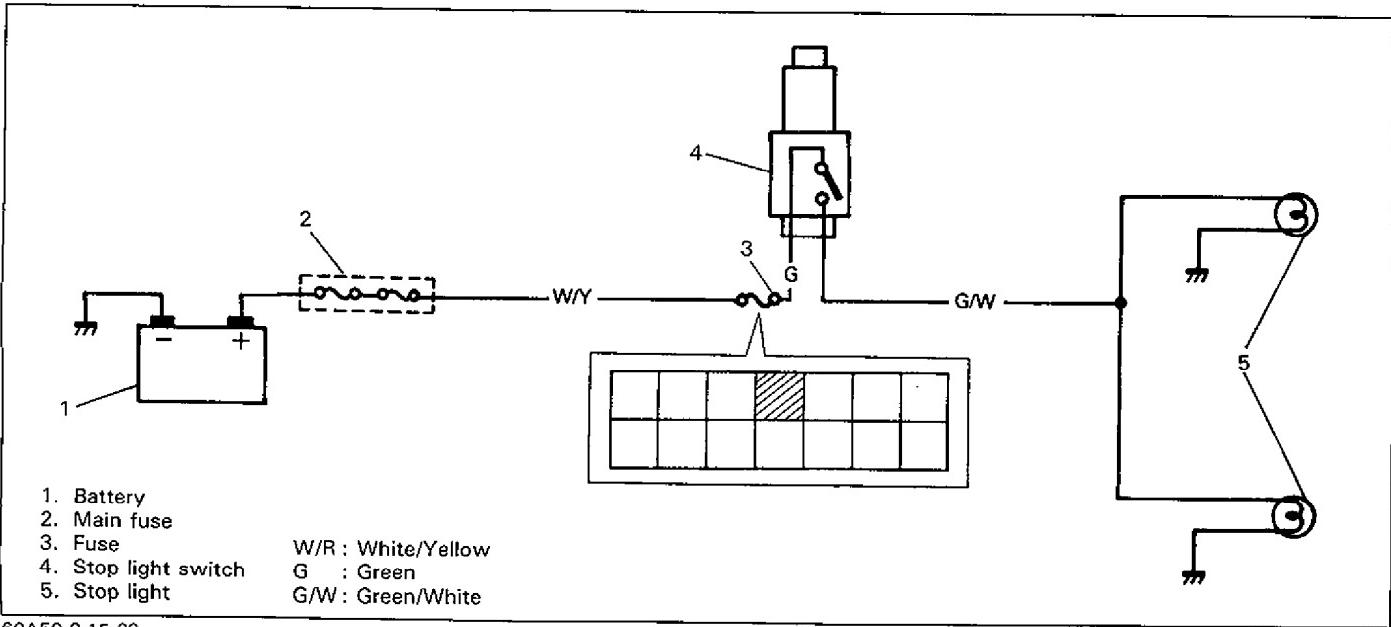
BACK-UP LIGHT**Wiring Circuit**

60A50-8-15-1S

Trouble Diagnosis

Trouble	Possible cause	Correction
Back-up lights do not light.	<ul style="list-style-type: none"> Fuse blown Back-up light switch faulty (M/T) Shift switch faulty or maladjusted (A/T) Wiring or grounding faulty 	<p>Replace fuse to check for short.</p> <p>Check switch.</p> <p>Check or adjust switch.</p> <p>Repair as necessary.</p>

60A50-8-15-2S

STOP LIGHTS**Wiring Circuit**

60A50-8-15-3S

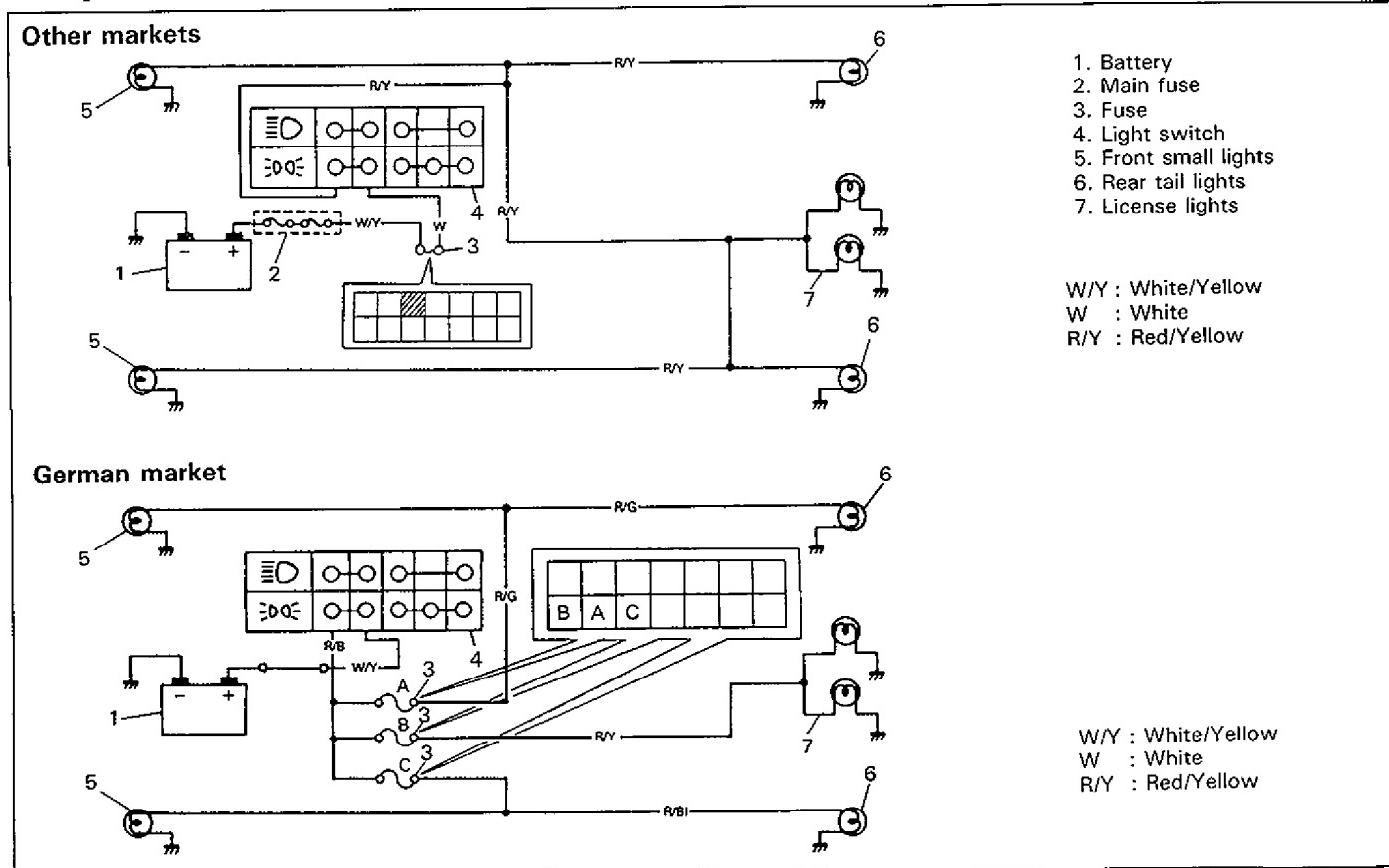
Trouble Diagnosis

Trouble	Possible cause	Correction
Stop lights do not light.	<ul style="list-style-type: none"> Fuse blown Stop light switch faulty Wiring or grounding faulty 	<p>Replace fuse to check for short.</p> <p>Adjust or replace switch.</p> <p>Repair as necessary.</p>
Stop lights stay on.	<ul style="list-style-type: none"> Stop light switch faulty 	Adjust or replace switch.

60A50-8-16-1S

SMALL, TAIL AND LICENSE LIGHTS

Wiring Circuit



60A50-8-16-2S

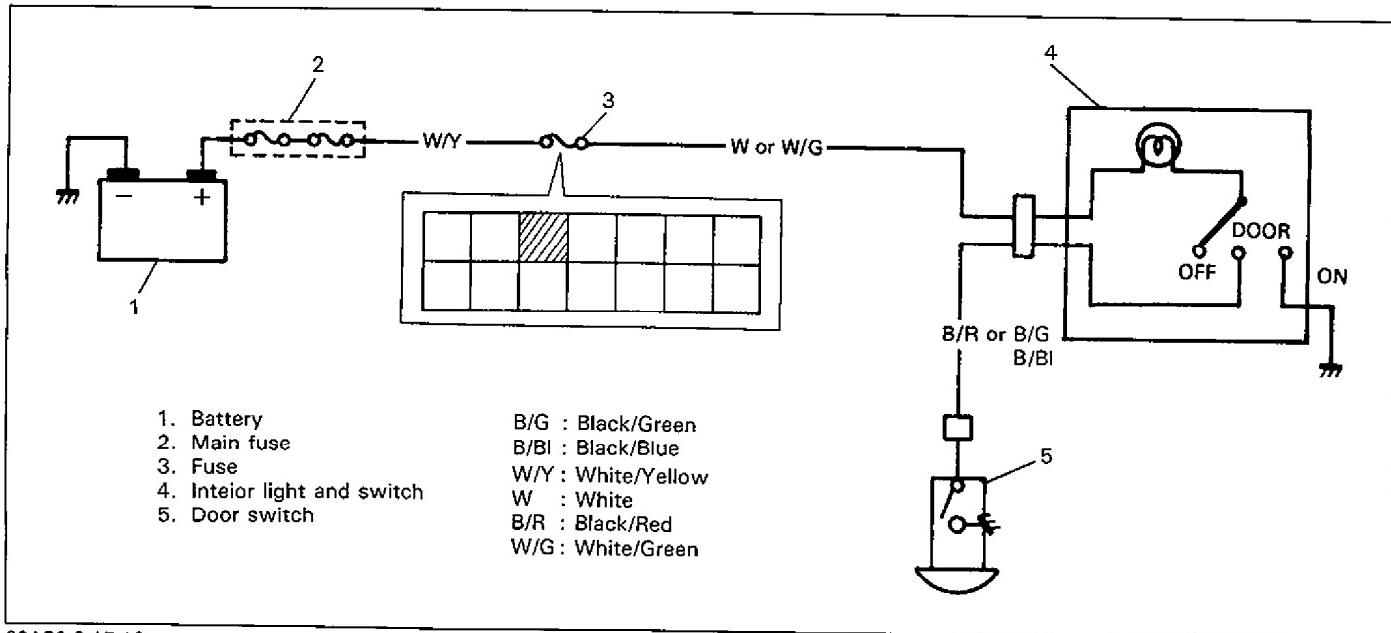
Trouble Diagnosis

Trouble	Possible cause	Correction
Lights do not light.	<ul style="list-style-type: none"> Main fuse and/or fuses blown Lighting switch faulty Wiring or grounding faulty 	<p>Replace main fuse and/or fuses to check for short.</p> <p>Check switch.</p> <p>Repair as necessary.</p>

60A50-8-16-3S

INTERIOR LIGHT

Wiring Circuit



60A50-8-17-1S

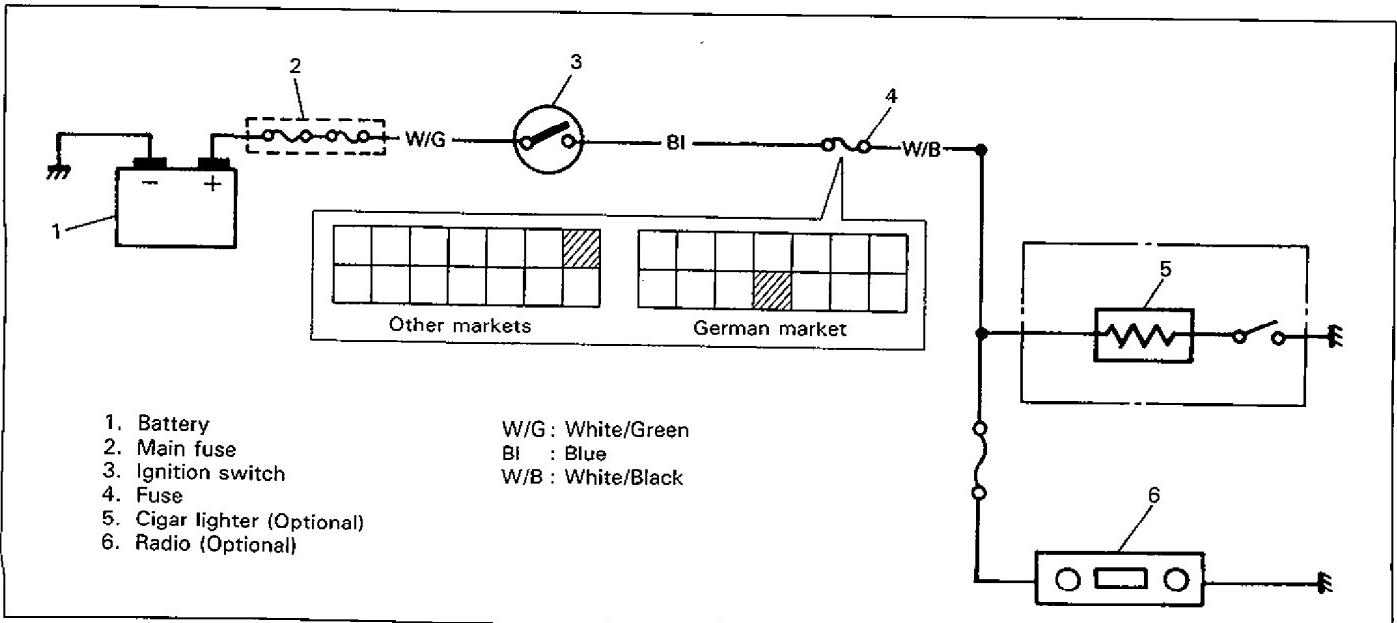
Trouble Diagnosis

Trouble	Possible cause	Correction
Interior light does not light.	<ul style="list-style-type: none"> Fuse blown Switch faulty Wiring or grounding faulty 	Replace fuse to check for short. Check switch. Repair as necessary.

60A50-8-17-2S

CIGAR LIGHTER, RADIO (OPTIONAL)

Wiring Circuit

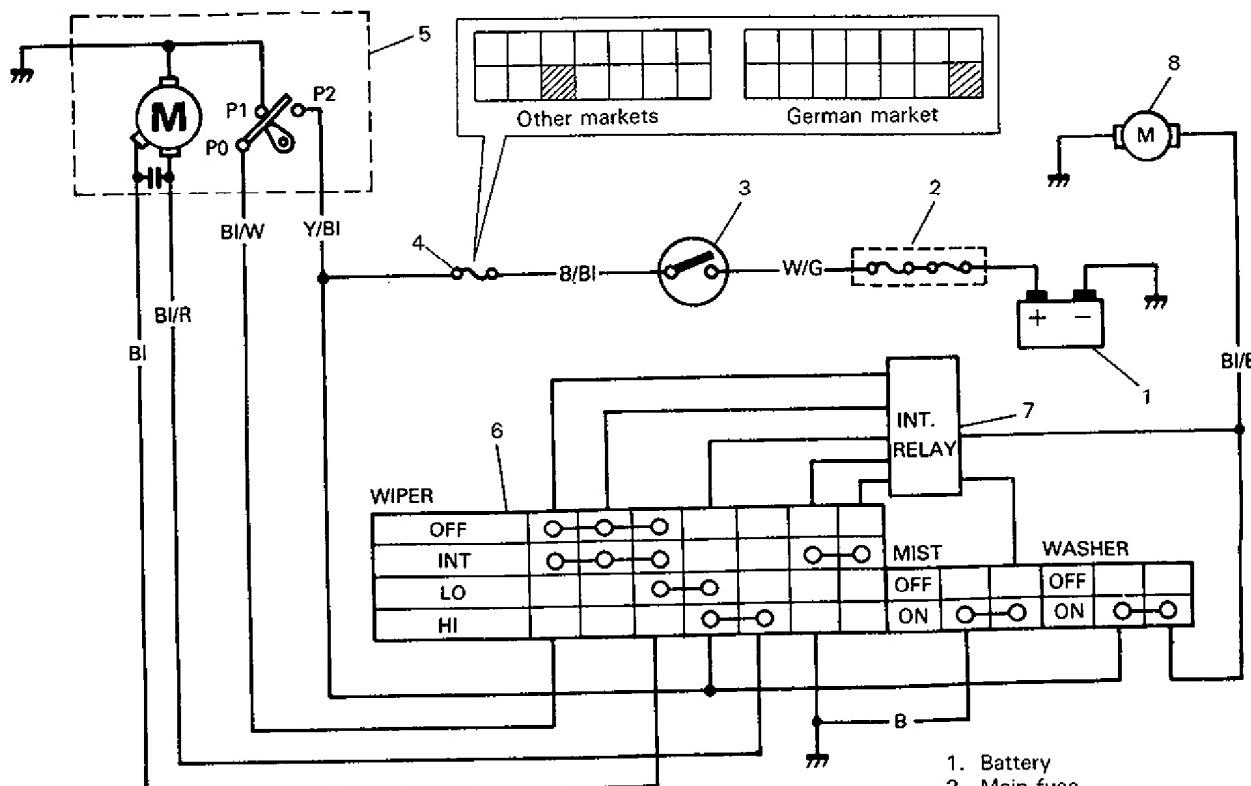


60A50-8-17-3S

WINDSHIELD WIPER (FRONT WIPER)

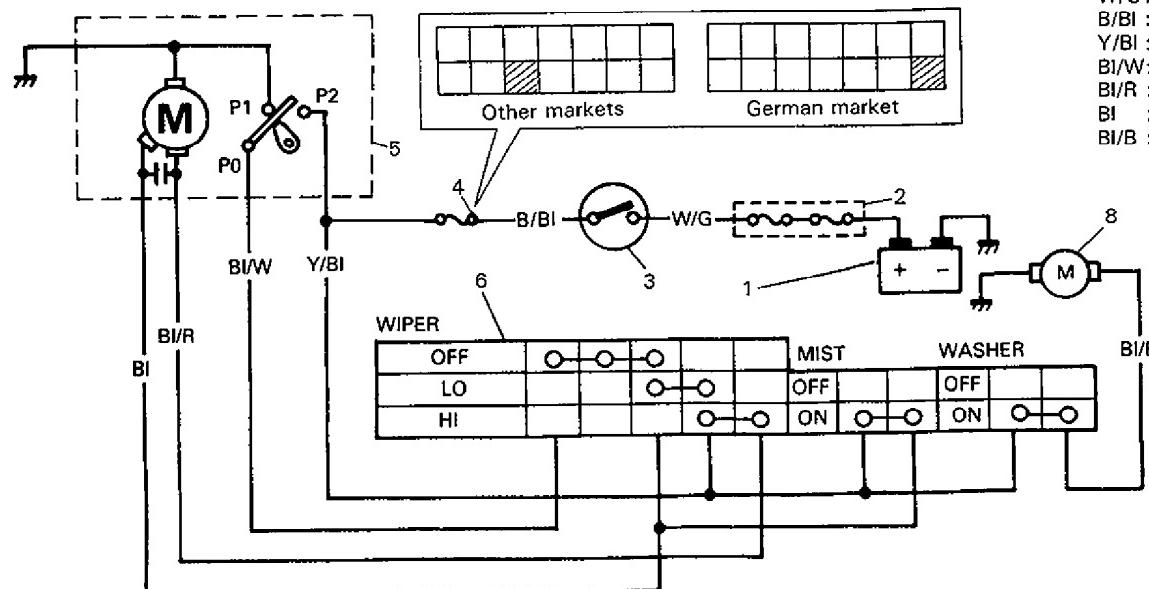
WIRING DIAGRAM

3-Speed Type



1. Battery
2. Main fuse
3. Ignition switch
4. Fuse
5. Wiper motor
6. Wiper, mist and washer switch
7. Intermittent wiper relay
8. Washer motor

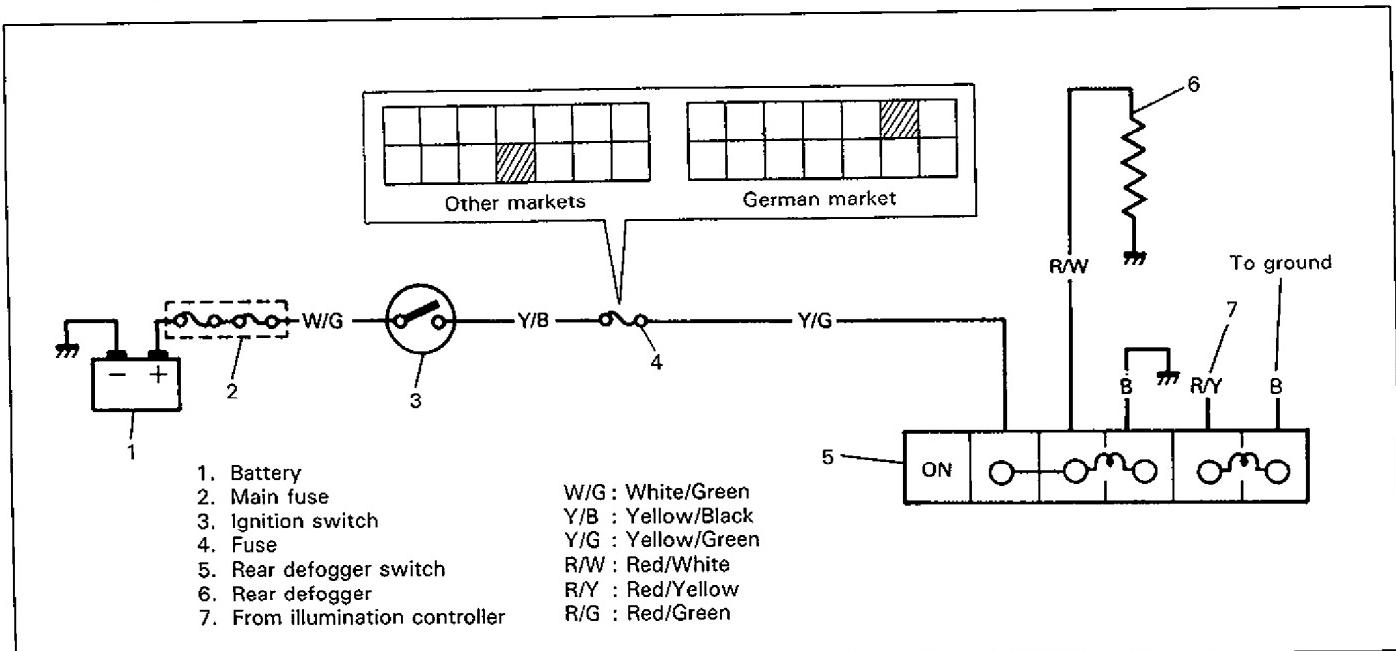
2-Speed Type



W/G : White/Green
 B/BI : Black/Blue
 Y/BI : Yellow/Blue
 BI/W : Blue/White
 BI/R : Blue/Red
 BI : Blue
 BI/B : Blue/Black

REAR WINDOW DEFOGGER (OPTIONAL)

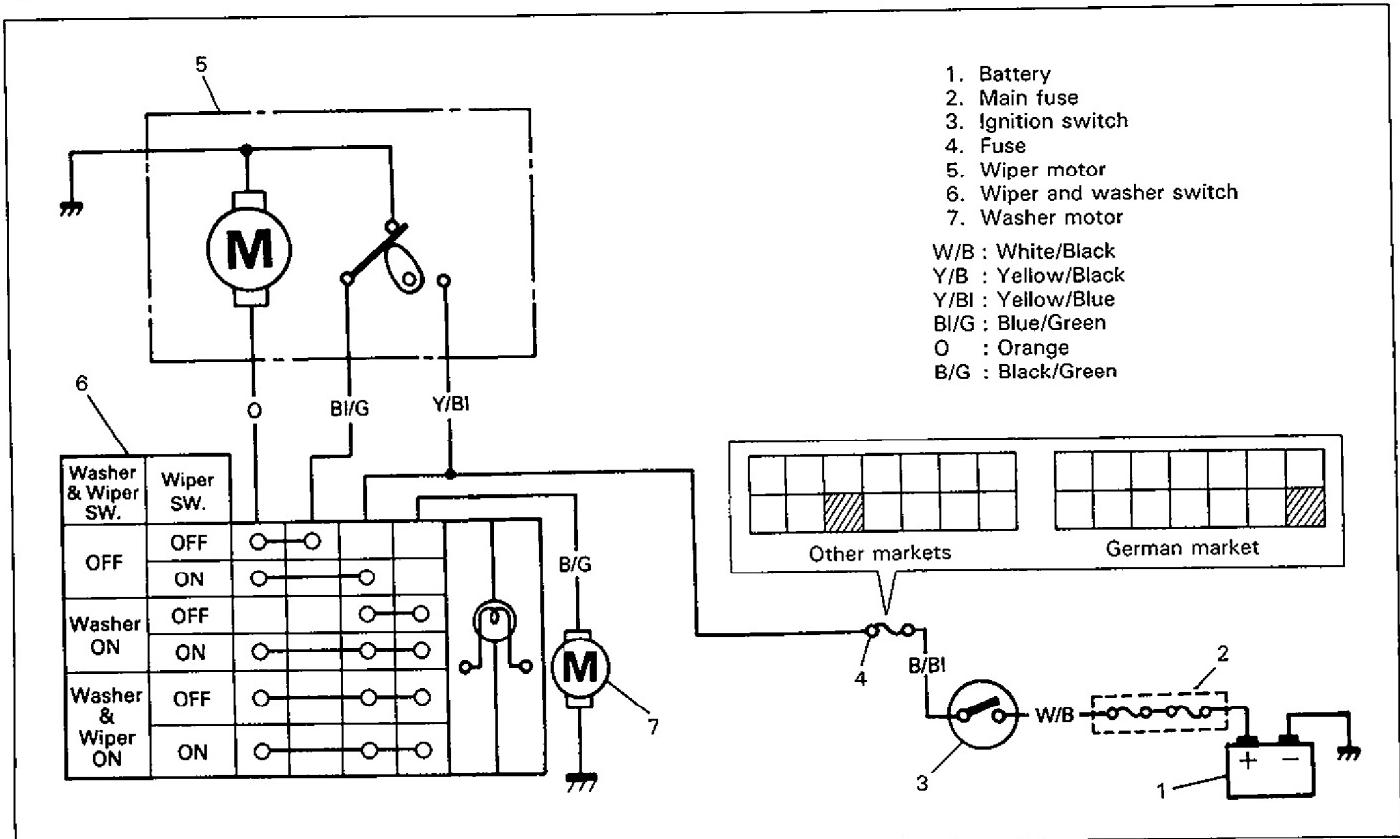
The optional rear window defogger system has horizontal ceramic silver compound elements and two vertical bus bar. The system is operated by the defogger switch in the instrument panel.



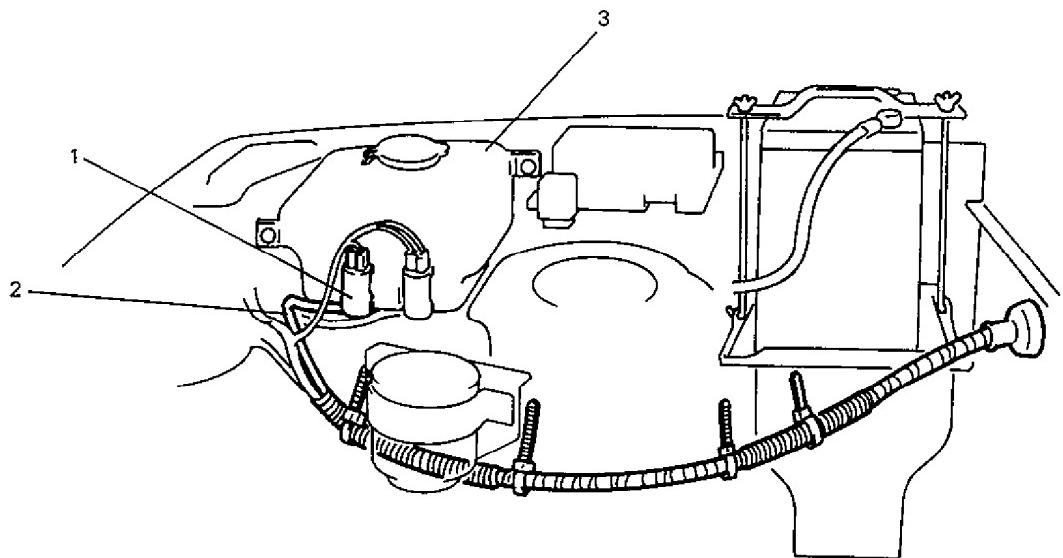
60A50-8-19-1S

REAR WINDOW WIPER AND WASHER (OPTIONAL)

The optional rear window wiper is of the one-speed type, and its washer is equipped with a separate-type washer pump.

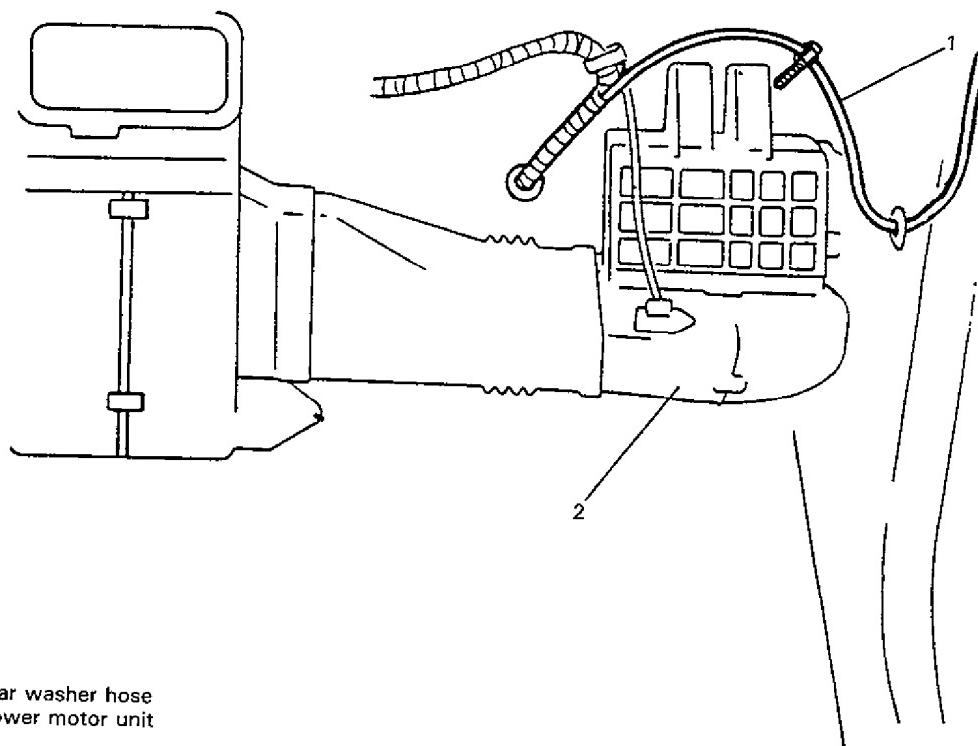


60A50-8-19-2S

REAR WASHER HOSE ROUTING:**In engine room**

1. Rear washer pump
2. Rear washer hose
3. Washer tank

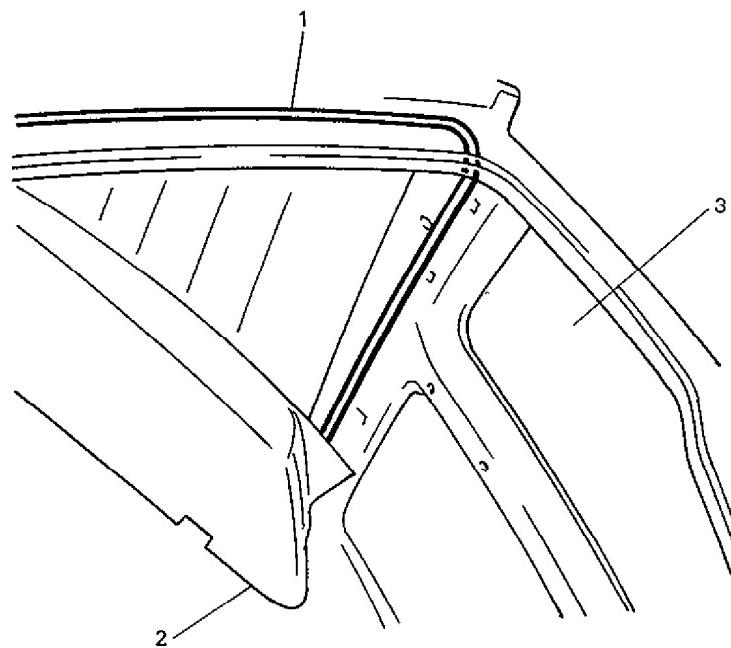
60A50-8-20-1S

On dash panel to right roof side inner panel

1. Rear washer hose
2. Blower motor unit

60A50-8-20-2S

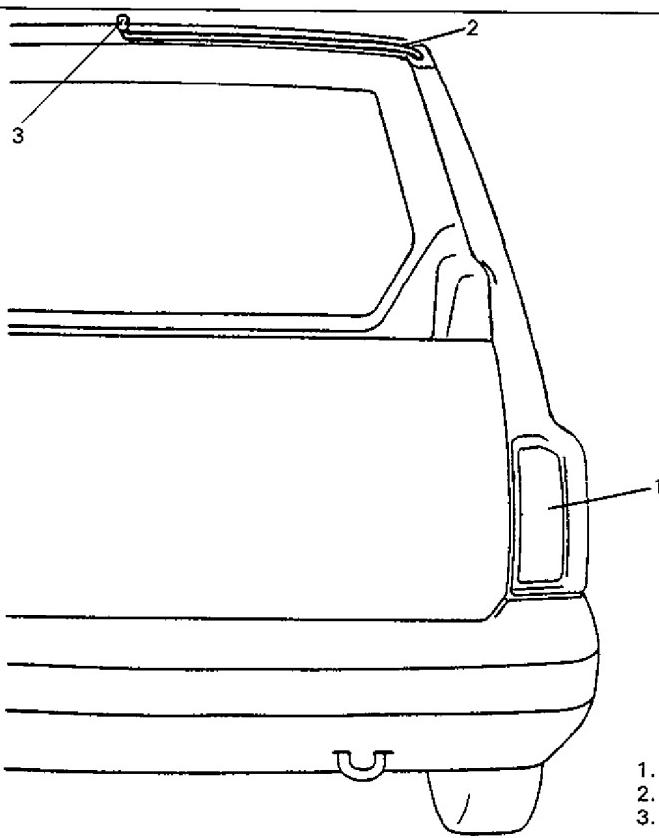
On right roof side inner panel to rear roof panel



1. Rear washer hose
2. Head lining
3. Rear quarter window

60A50-8-21-1S

To washer nozzle

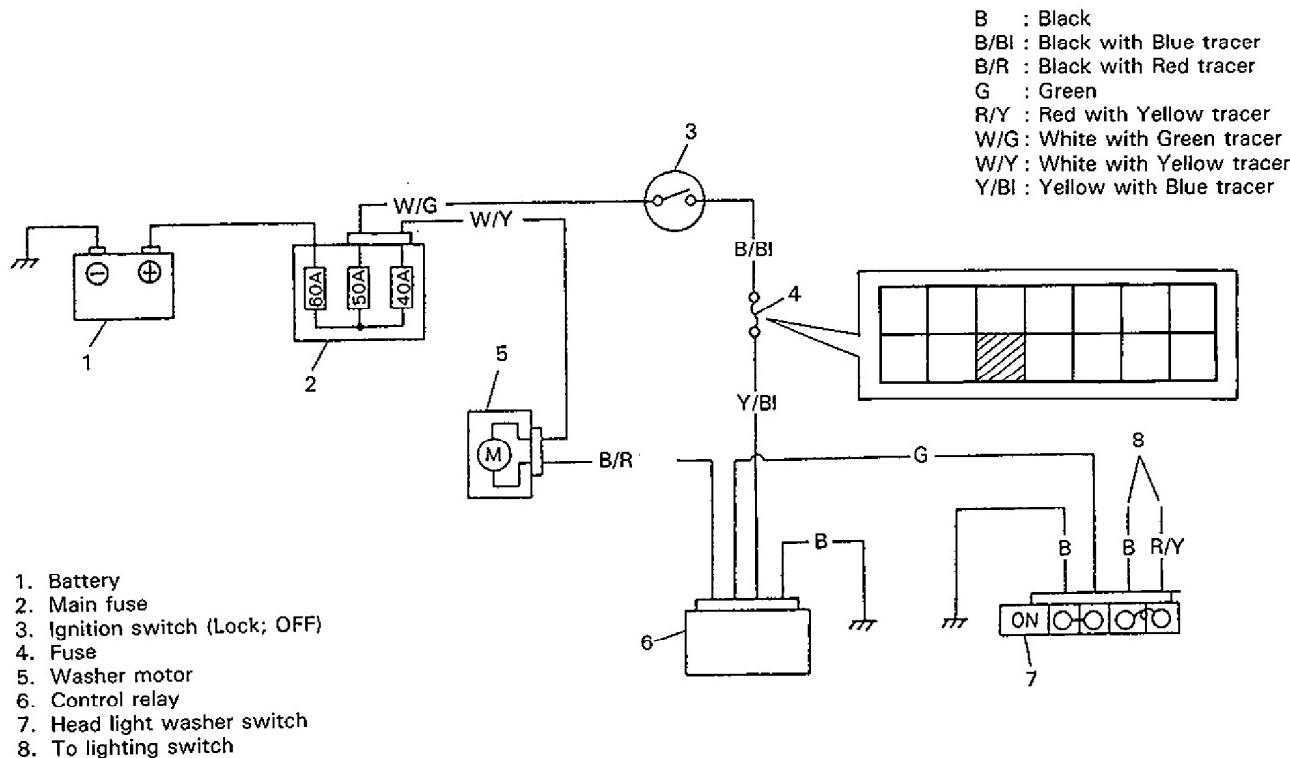


1. Rear combination light (Right)
2. Rear washer hose
3. Washer nozzle

60A50-8-21-2S

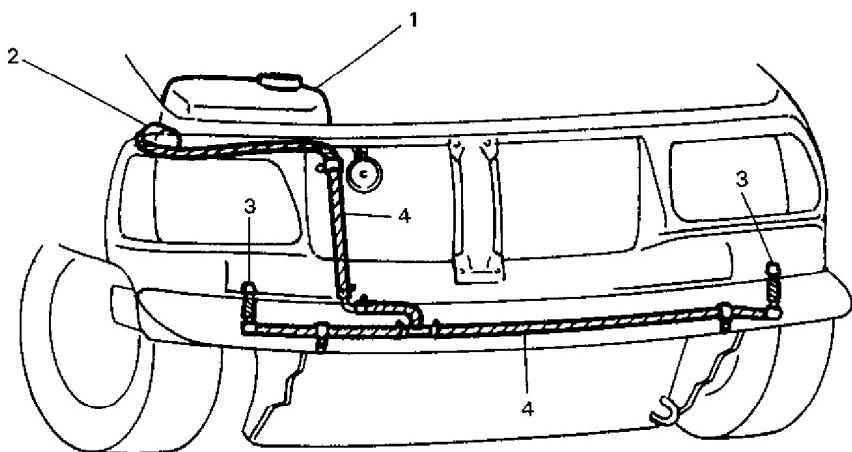
HEAD LIGHT WASHER (IF EQUIPPED)

WIRING DIAGRAM



60A50-8-22-1S

HOSE ROUTING

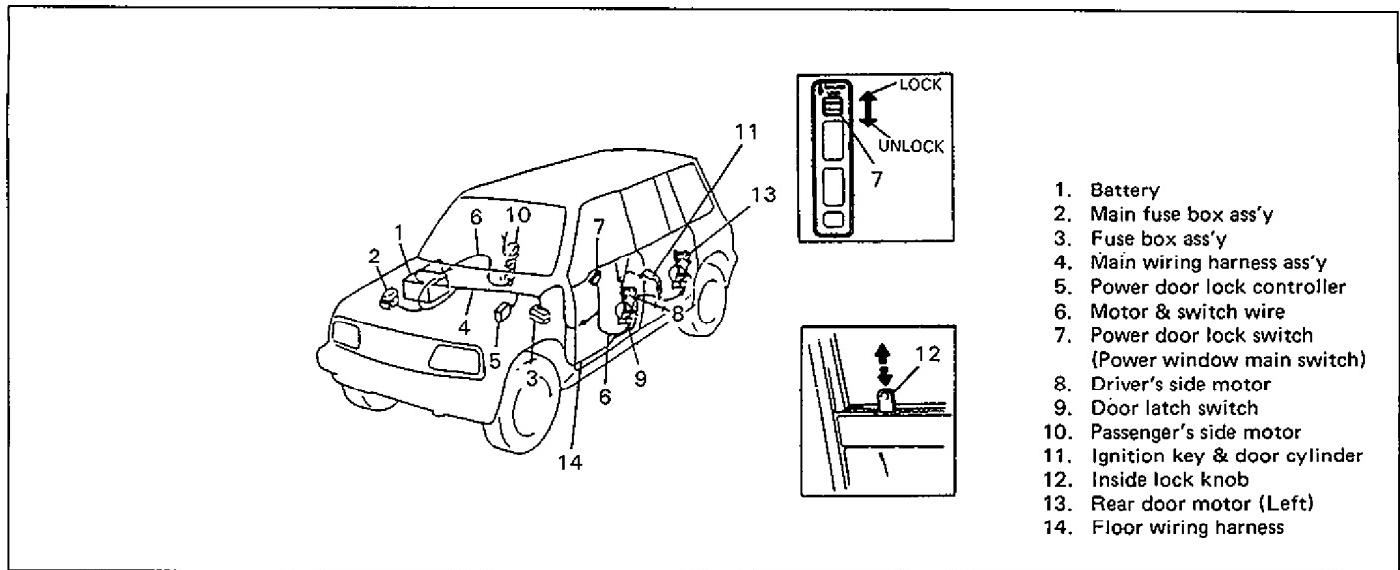


1. Washer tank
 2. Washer motor
 3. Nozzle
 4. Hose

60A50-8-22-2S

CENTRAL LOCKING SYSTEM (If equipped)

The central locking system consists of the power door lock controller, door lock switch, door latch switch, ignition key & door cylinder, motors and related wiring harness.

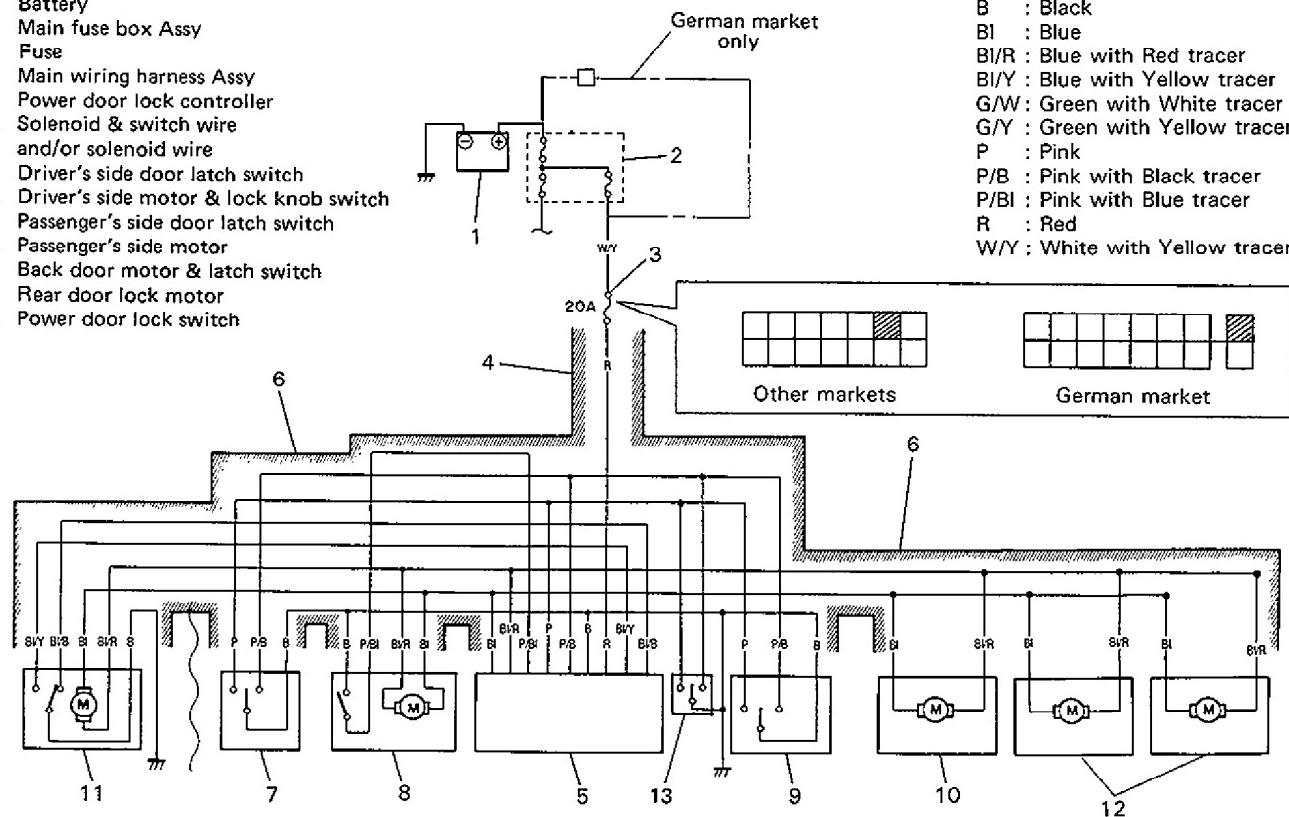


60A50-8-23-1S

WIRING DIAGRAM

1. Battery
2. Main fuse box Assy
3. Fuse
4. Main wiring harness Assy
5. Power door lock controller
6. Solenoid & switch wire and/or solenoid wire
7. Driver's side door latch switch
8. Driver's side motor & lock knob switch
9. Passenger's side door latch switch
10. Passenger's side motor
11. Back door motor & latch switch
12. Rear door lock motor
13. Power door lock switch

B	: Black
Bl	: Blue
Bi/R	: Blue with Red tracer
Bi/Y	: Blue with Yellow tracer
G/W	: Green with White tracer
G/Y	: Green with Yellow tracer
P	: Pink
P/B	: Pink with Black tracer
P/Bl	: Pink with Blue tracer
R	: Red
W/Y	: White with Yellow tracer



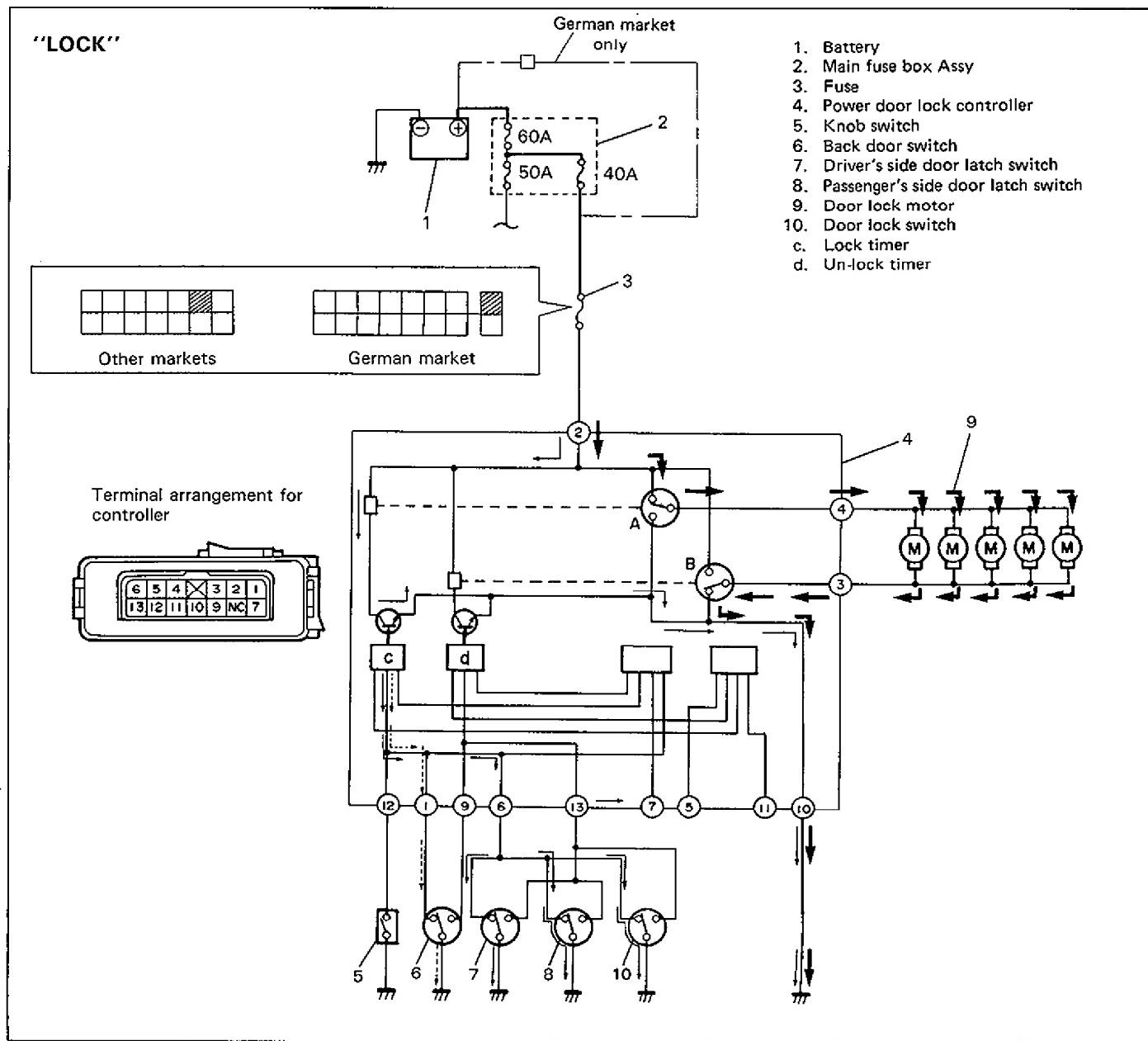
60A50-8-23-2S

CENTRAL LOCKING SYSTEM CIRCUIT AND OPERATION

LOCKING OPERATION

Figure below shows the central locking system circuit in operation as "LOCK".

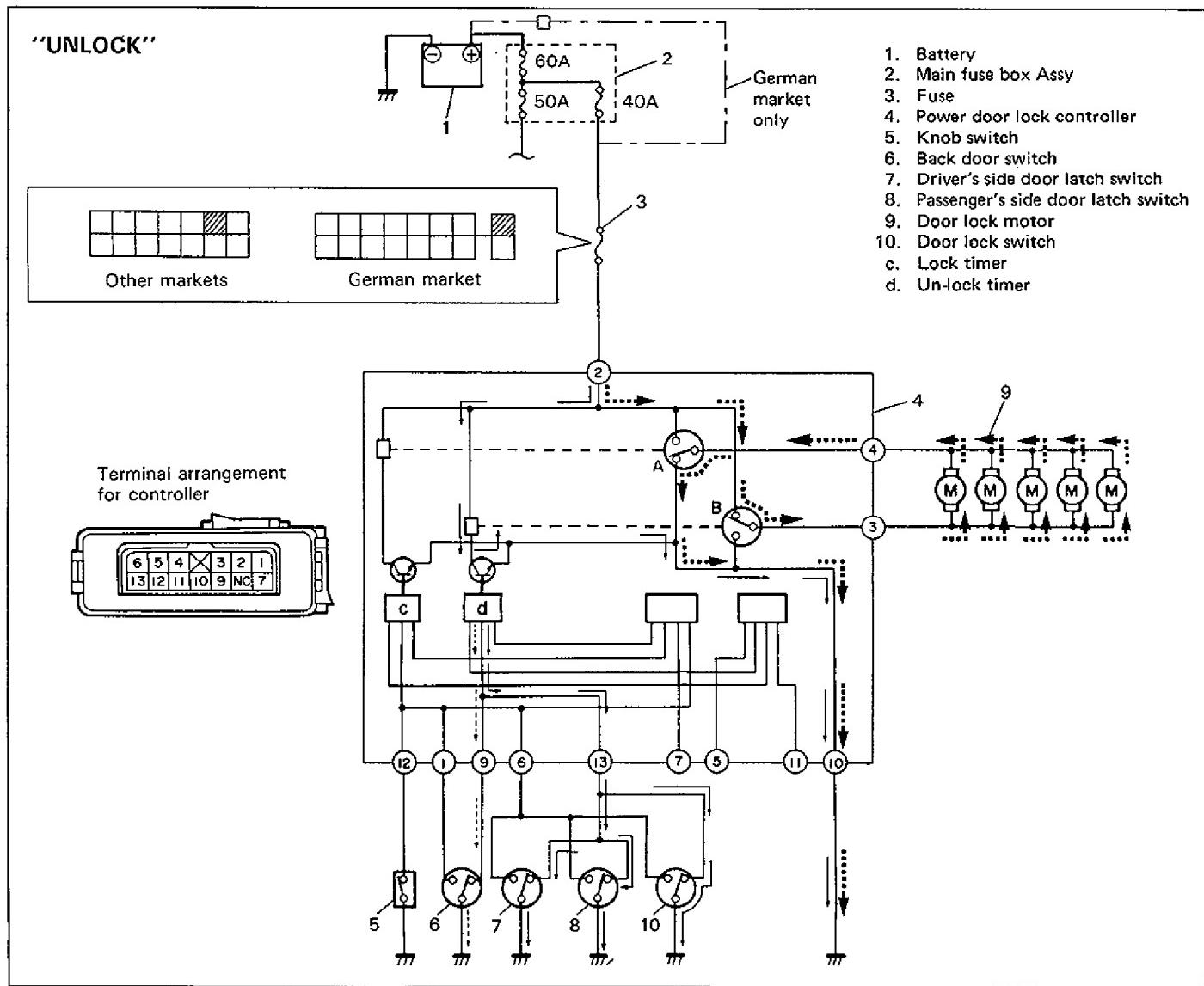
1. When the ignition key is used to lock the door or the door lock switch is set to the "LOCK" position, the electric current flows as shown by fine line (→).
2. Then the switch A which is built in the power door lock controlled turn ON for their "LOCK" side and the electric current flows as shown by thick line (→) to cause the motor to operate.
3. The arrow (→) shows the electric current flow when the back door lock is set to the lock position. Also, when setting the knob on the driver's side to the lock position, it flows as shown by the arrow (→) to lock the door.
4. As the electric current flowing to motor is controlled by the timer c which is built in the power door lock controller, switch A automatically turn OFF and electric current flow stops.



UNLOCKING OPERATION

Figure below shows the circuit in operation as "UNLOCK".

- When the ignition key is used to unlock the door or the door lock switch is set to the "UNLOCK" position, the electric current flows as shown by fine line (→).
- Then the switch B which is built in the power door lock controller turn ON for their "UNLOCK" side and the electric current flows as shown by thick broken line (↔) to cause the motor to operate.
- When the back door lock is set to the unlock position, the electric current flows as shown by the arrow (→) to unlock the door.
- As the electric current flowing to motor is controlled by the timer d the switch B automatically turns OFF and the electric current flow stops.



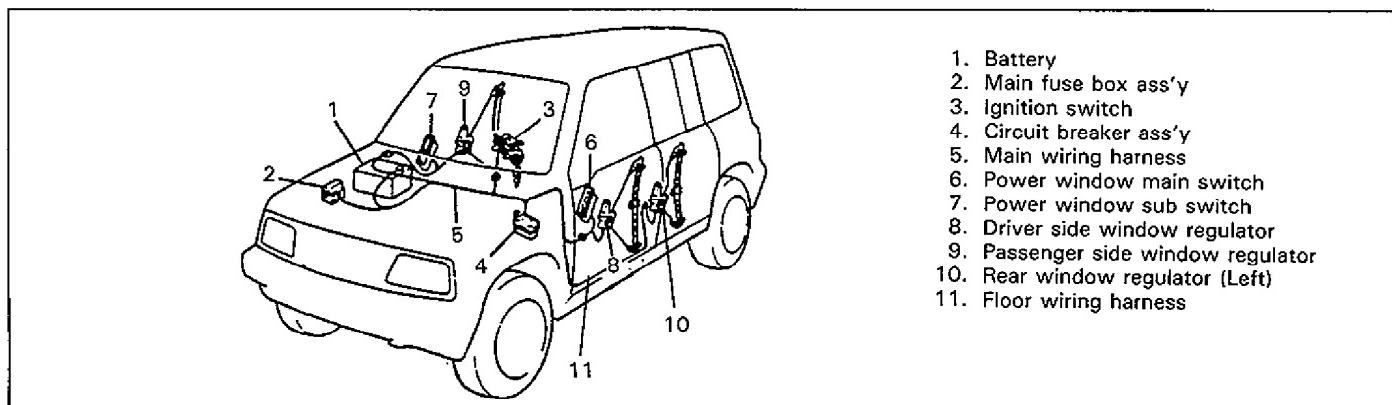
Trouble diagnosis

Condition	Possible cause	Correction
All power door locks do not operate.	<ul style="list-style-type: none">• Main fuse and/or fuses blown• Wiring or grounding faulty• Power door lock switch, door lock switch or knob switch faulty• Controller faulty	<p>Replace main fuse and/or fuses to check for short. Repair as necessary. Replace.</p> <p>Replace.</p>
Only one power door lock does not operate.	<ul style="list-style-type: none">• Wiring or socket faulty• Actuator (door lock motor) faulty	<p>Repair as necessary. Replace.</p>

60A50-8-26-1S

POWER WINDOW CONTROL SYSTEM (If equipped)

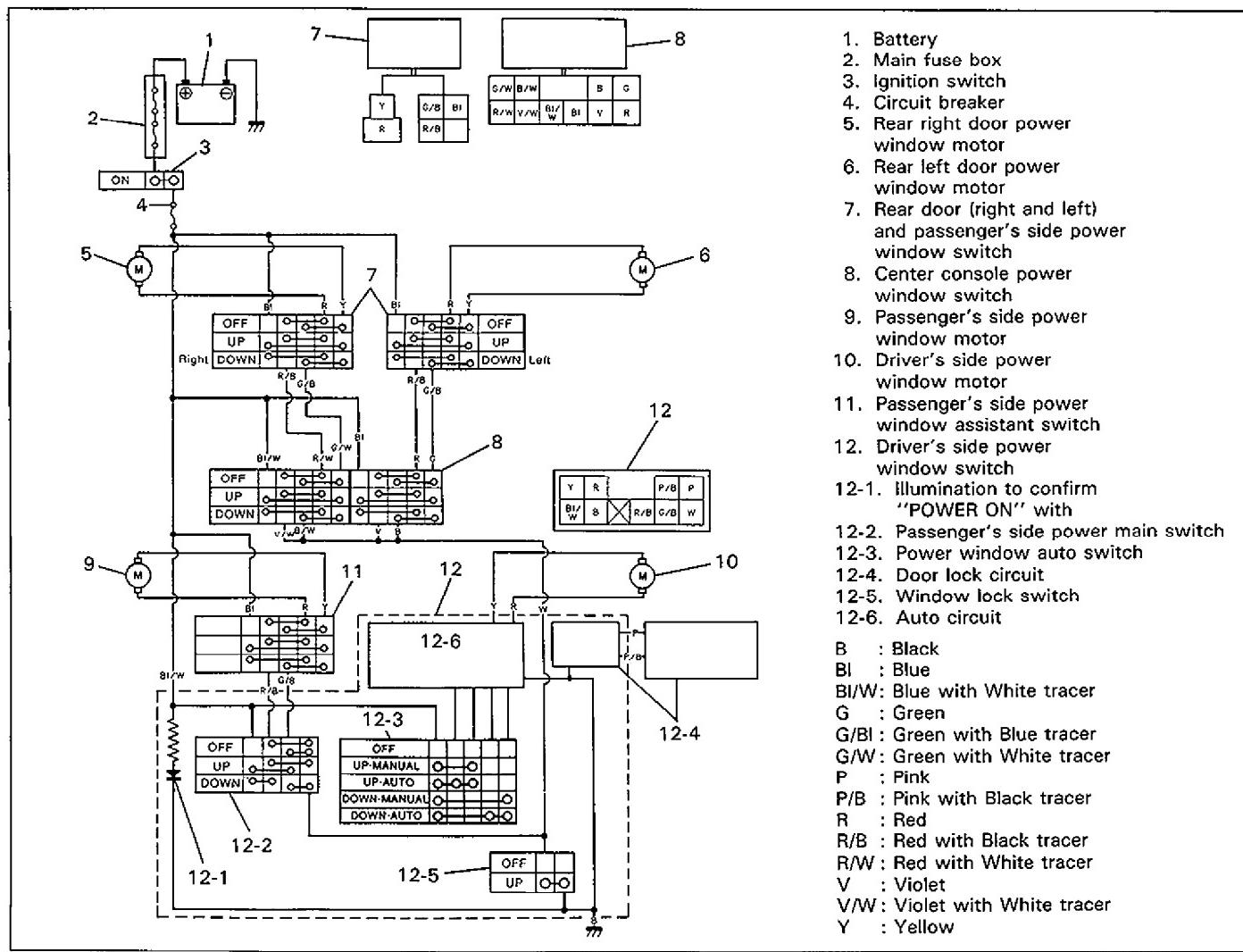
The power window control system is so designed that it electrically controls up & down movement of side door window glass by means of the motor which is installed to the window regulator. The system consists of the ignition switch, power window switches, window regulator motors and related wiring harness. The figure below shows location of its component parts and wiring diagram.



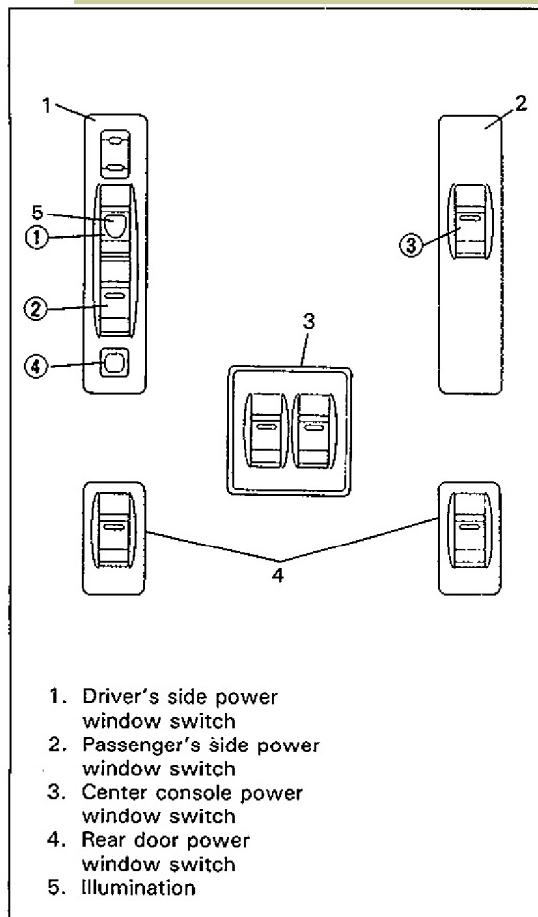
60A50-8-27-1S

1. Battery
2. Main fuse box ass'y
3. Ignition switch
4. Circuit breaker ass'y
5. Main wiring harness
6. Power window main switch
7. Power window sub switch
8. Driver side window regulator
9. Passenger side window regulator
10. Rear window regulator (Left)
11. Floor wiring harness

WIRING DIAGRAM



60A50-8-27-2S



60A50-8-28-1S

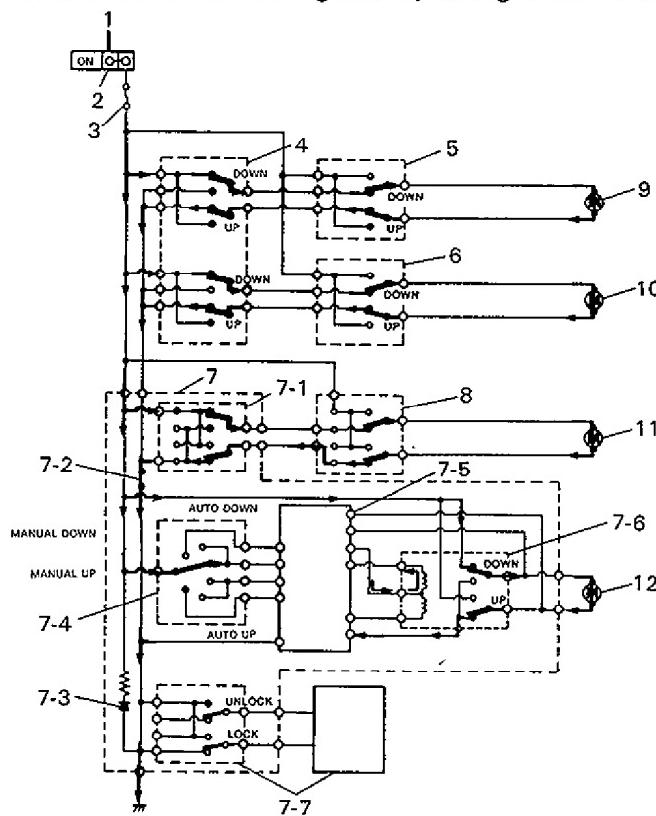
OPERATION OF POWER WINDOW SYSTEM

The power window main switch in the driver's side door trim controls up & down movement of both driver's side window by switch ① and passenger's side window by switch ②. Also, driver's side switch has an auto-up function. The sub switch ③ in the passenger's side door trim controls the passenger's side window only. The window lock switch ④ also in the power window main switch locks passenger's side window. As long as this switch is depressed (The switch is turned "OFF" in the circuit), the passenger's side window does not move even when the passenger's side sub switch ③ or driver's side passenger switch ② are operated. Rear window regulator, like passenger's side regulator, can be controlled by center console switches ⑤ and rear door switches ⑥ when window lock switch is not applied. In this system, up & down movement of the window is done as follows.

Setting center console switch for downward operation when ignition switch is ON and window lock switch is not applied will cause electric current to flow in its circuit as shown by an arrow.

When window lock switch is applied, rear window or passenger's side window can not be opened or closed by using center console switch or master switch. With ignition OFF, no power window operation is available and the illumination remains OFF.

Downward operation of window glass by using driver's side switch and center console switch.

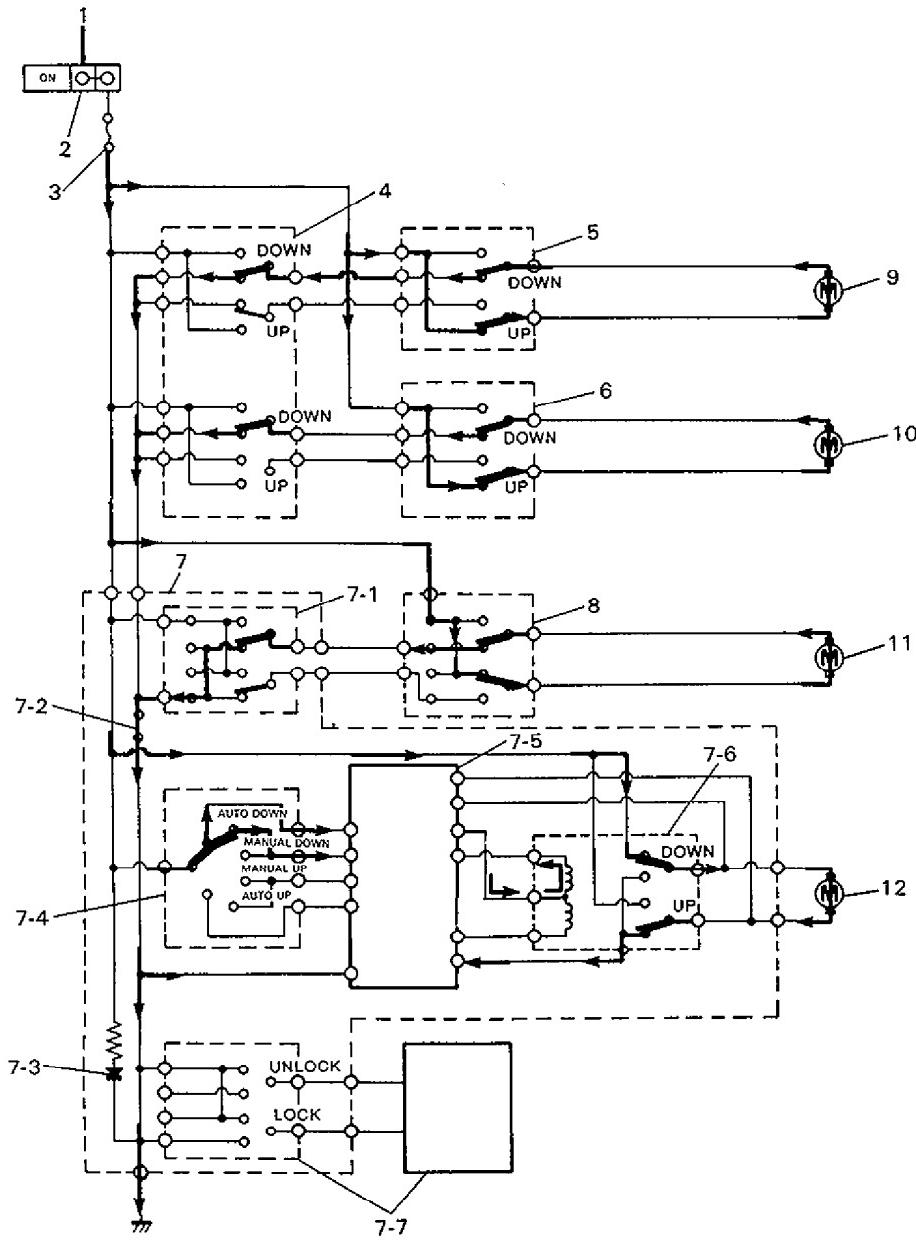


60A50-8-28-2S

OPERATION OF POWER WINDOW AUTO SYSTEM

When rear door sub switch or passenger assist switch is set for upward operation and driver's side switch for AUTO down operation, electric current flows in circuit as shown below. AUTO function works when driver's side regulator switch is tilted at least 7° but if its tilt angle is less than 7°, the operation is in the manual mode. If the switch is set to the manual operation mode (tilted at least 7°) from automatic operation mode, the automatic operation mode will be cancelled. When the window glass reaches its lower end in the automatic operation mode, the load applied to the motor increases and so does the electric current. Thus the electric current flowing to the solenoid stops and relay turns OFF, resulting in motor stop.

Automatic downward operation of window glass by using driver's side automatic switch.
Upward operation of window glass by using passenger's side switch and rear door switch.



1. From battery
2. Ignition switch
3. Fuse
4. Center console power window switch
5. Rear right door power window switch
6. Rear left door power window switch
7. Driver's side power window main switch
- 7-1. Passenger's side power window switch
- 7-2. Window lock switch
- 7-3. Illumination to confirm "POWER ON" with
- 7-4. Power window auto switch
- 7-5. Auto circuit
- 7-6. Auto relay
- 7-7. Door lock circuit
8. Passenger's side power window assistant switch
9. Rear right door power window motor
10. Rear left door power window motor
11. Passenger's side power window motor
12. Driver's side power window motor

Trouble Diagnosis

Condition	Possible cause	Correction
All power window motors do not operate.	<ul style="list-style-type: none">• Main fuse and/or fuses blown• Wiring or grounding faulty	Replace main fuse and/or fuses to check for short. Repair as necessary.
Some switches do not operate.	<ul style="list-style-type: none">• Wiring or socket faulty• Window lock switch faulty	Repair as necessary. Replace.
Only one actuator does not fault.	<ul style="list-style-type: none">• Wiring or socket faulty• Actuator faulty	Repair as necessary. Replace.

60A50-8-30-1S

HEADLIGHT BEAM LEVELING SYSTEM

(For German market)

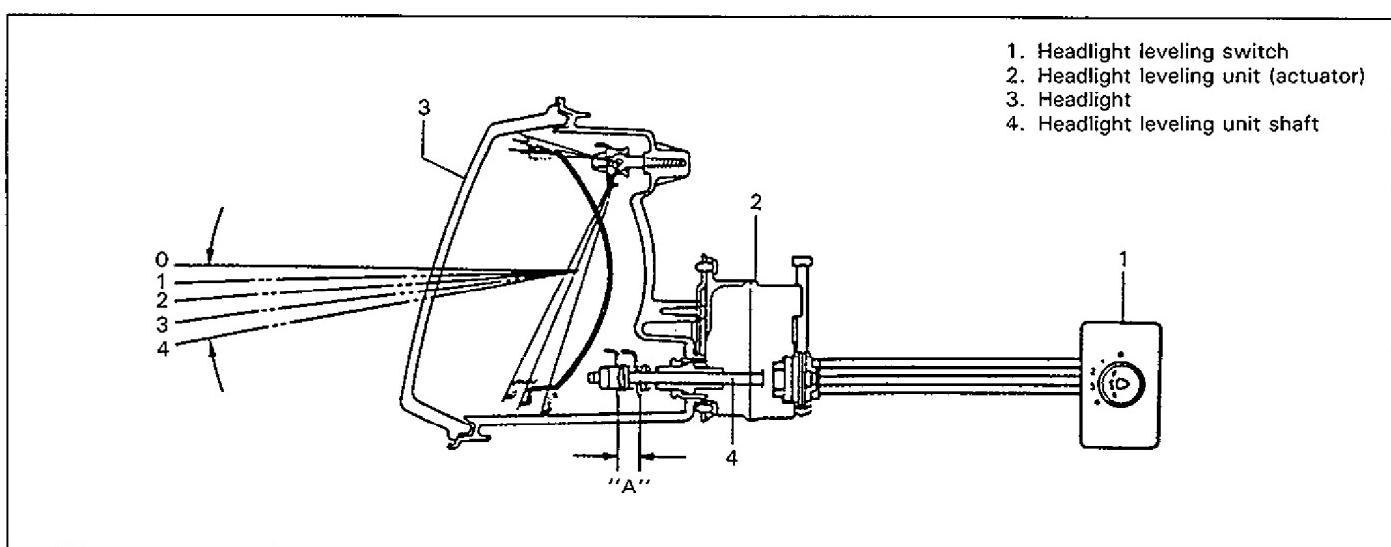
This system consists of the headlight leveling switch and headlight leveling actuator. It is used to lower both headlight aiming angles from the initial setting level by operating the leveling switch on the instrument.

NOTE:

When inspecting and adjusting the headlight beam, make sure to set the leveling switch to the "0" position with the ignition switch "ON", or down stroke from the initial setting level will be reduced.

OPERATION

The headlight leveling actuator is mounted behind headlight assembly and connected to the headlight reflector. When the headlight leveling switch knob is turned, the headlight leveling actuator operates and it changes the headlight aiming angle according to the position selected by the leveling switch knob.



1. Headlight leveling switch
2. Headlight leveling unit (actuator)
3. Headlight
4. Headlight leveling unit shaft

Switch position	Headlight beam level	Stroke "A"
0	Initial setting level	—
1		—
2		—
3		—
4	Max. down level	Max. 3.6 mm (0.14 in)

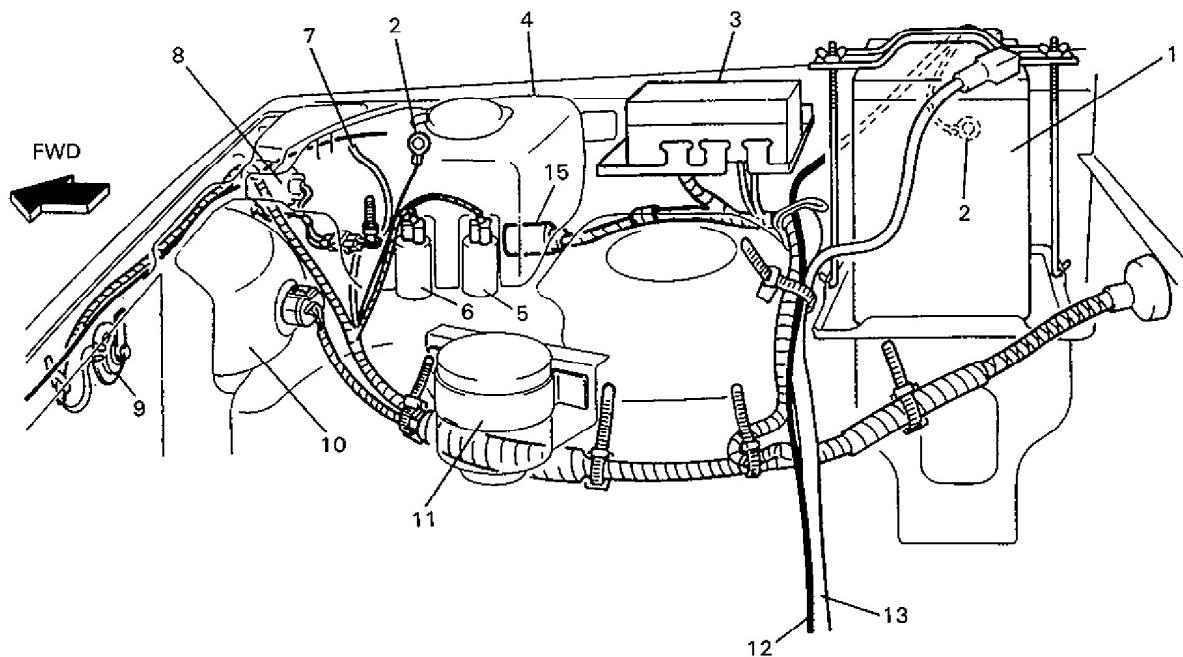
60A50-8-31-1S

WIRING HARNESS ROUTING

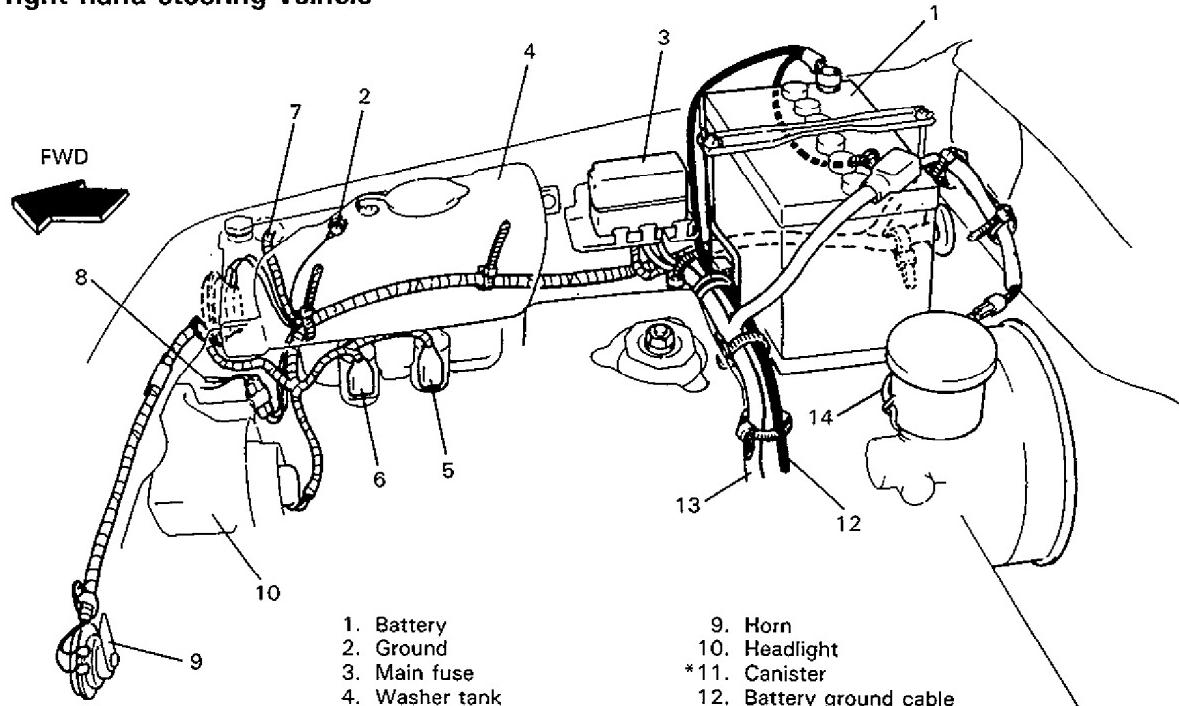
NOTE:

Whether equipped with * marked parts or not depends on vehicle specification.

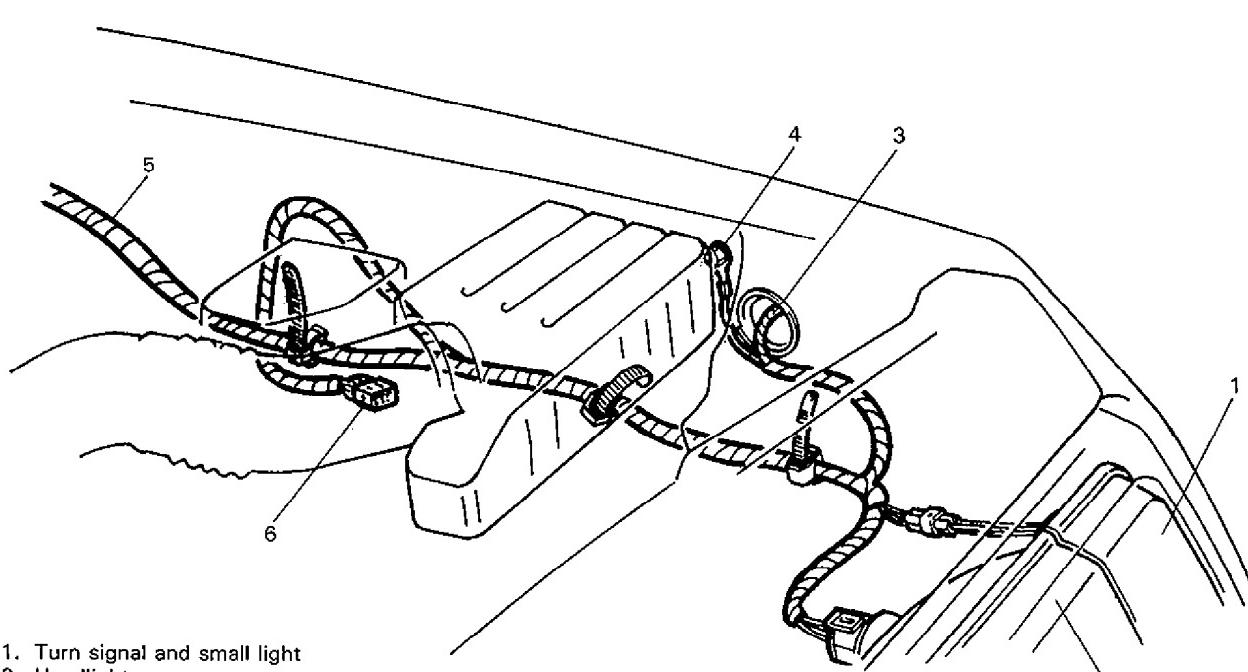
For left hand steering vehicle



For right hand steering vehicle

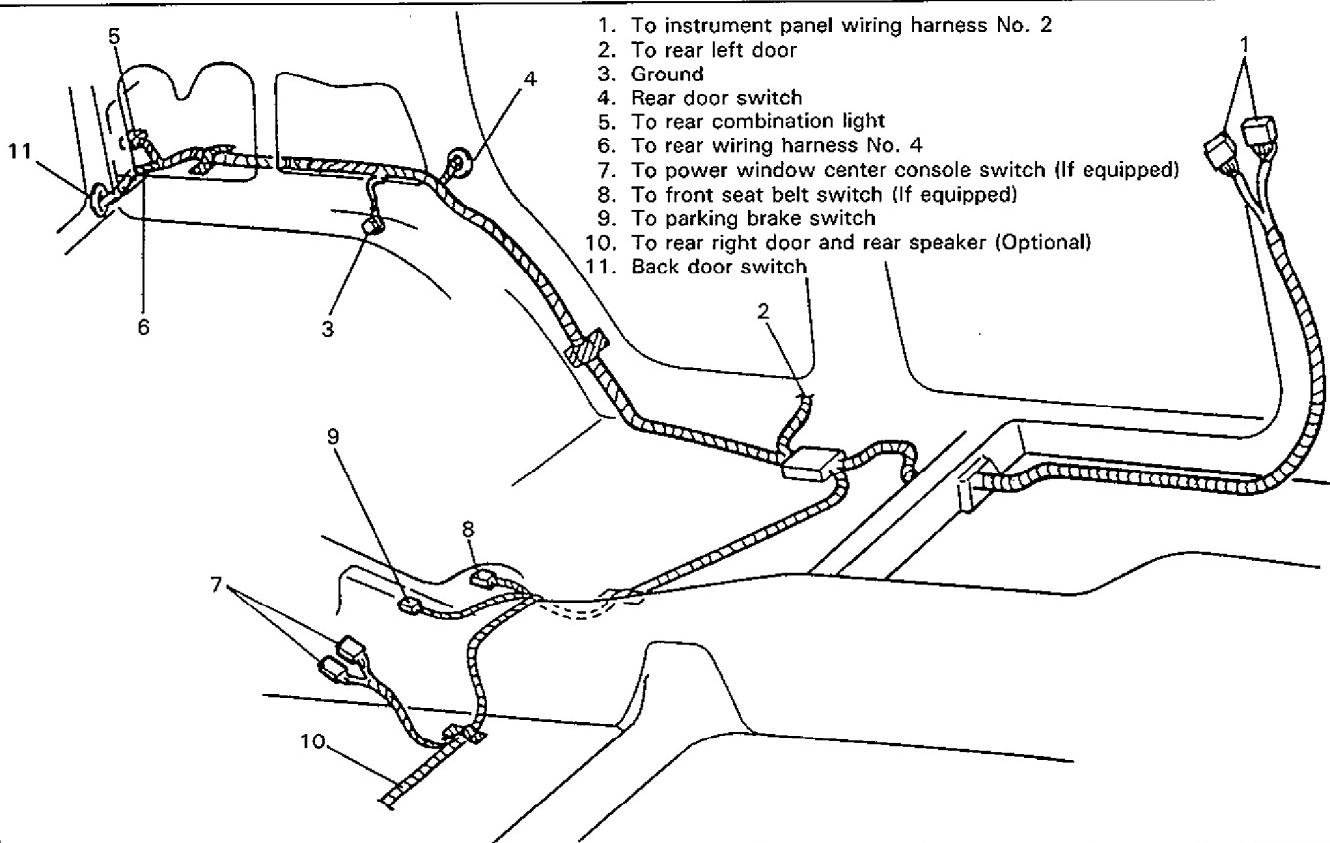


- | | |
|--------------------------------|----------------------------------|
| 1. Battery | 9. Horn |
| 2. Ground | 10. Headlight |
| 3. Main fuse | *11. Canister |
| 4. Washer tank | 12. Battery ground cable |
| 5. Front washer pump | 13. To generator and starter |
| *6. Rear washer pump | *14. To brake fluid level switch |
| 7. To side turn signal light | *15. Headlight washer pump |
| 8. Turn signal and small light | |

LEFT SIDE INNER FENDER WIRING

1. Turn signal and small light
2. Headlight
3. To left side turn signal
4. Ground
5. Main wiring harness No. 1
6. To air flow meter

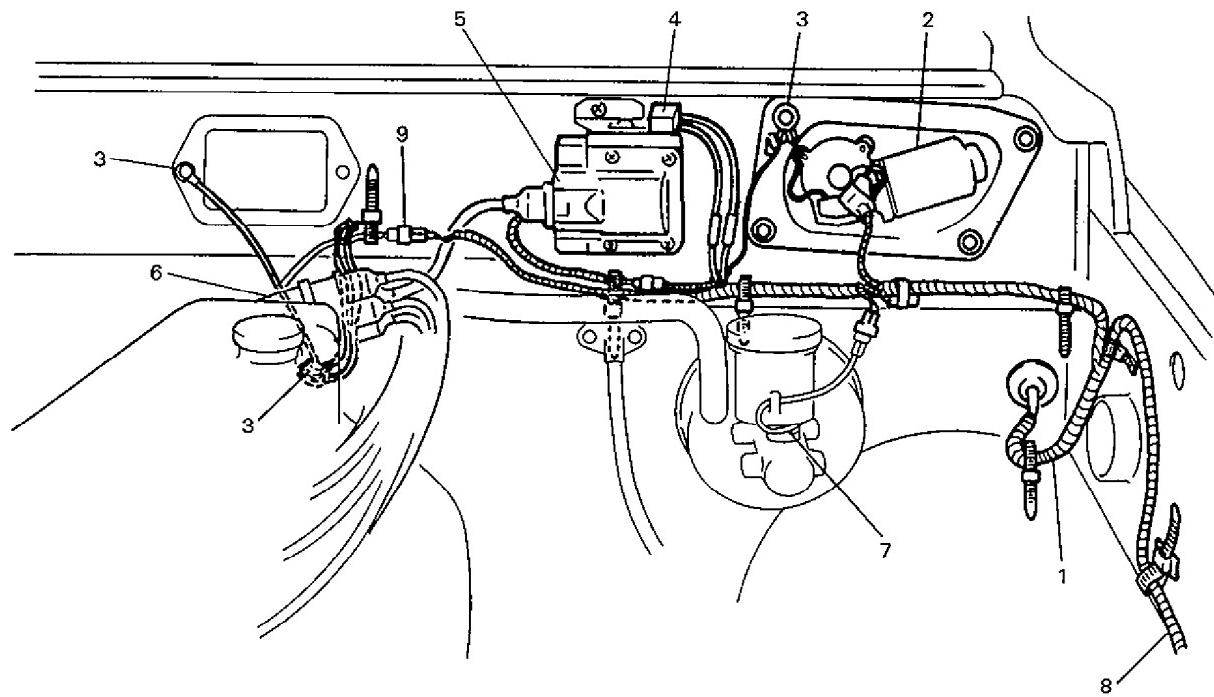
60A50-8-33-1S

FLOOR WIRING

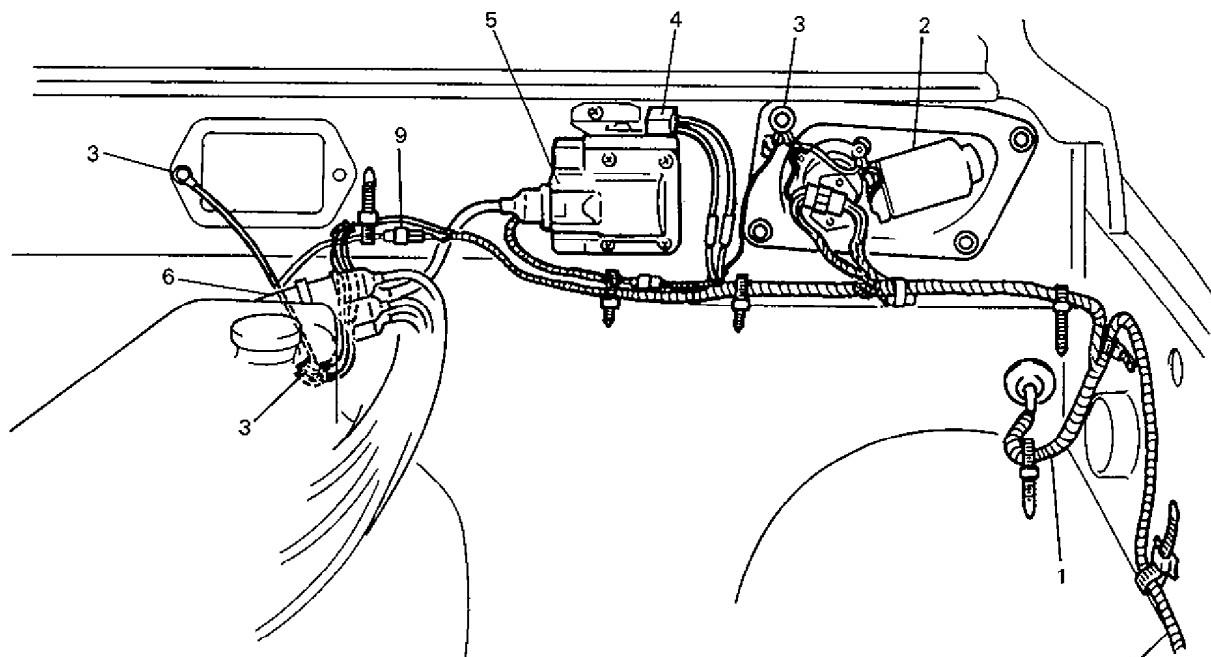
60A50-8-33-2S

ENGINE ROOM WIRING NO. 1

For left hand steering vehicle

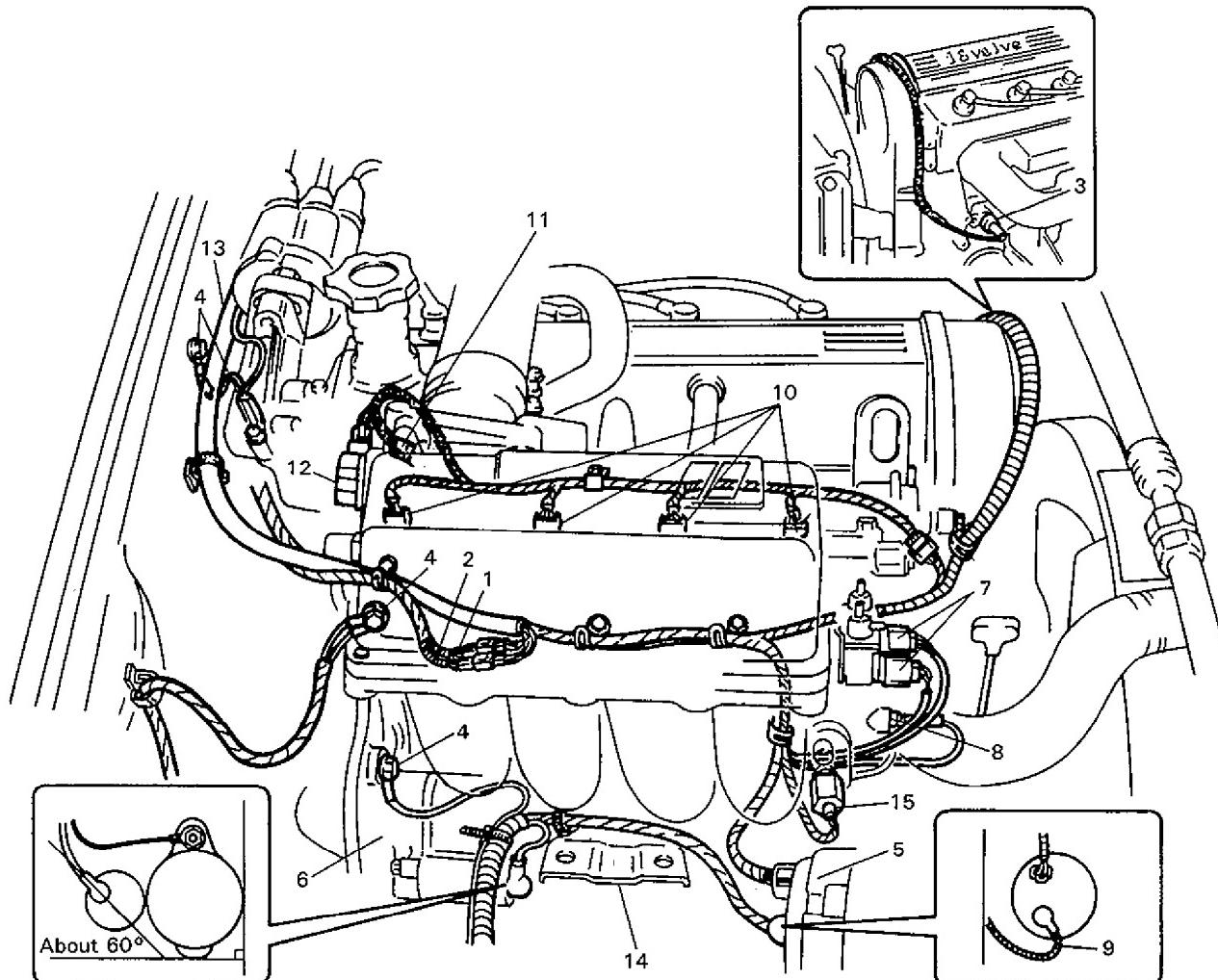


For right hand steering vehicle



- | | |
|---------------------------------|------------------------------------|
| 1. Main wiring harness No. 1 | 6. Distributor |
| 2. Front wiper motor | *7. To brake fluid level switch |
| 3. Ground | 8. To head light, side turn signal |
| 4. Condenser (Noise suppressor) | 9. To distributor |
| 5. Ignition coil | |

ENGINE ROOM WIRING NO. 2

Installing direction of
starter wireInstalling direction of generator
"B" terminal**NOTE:**

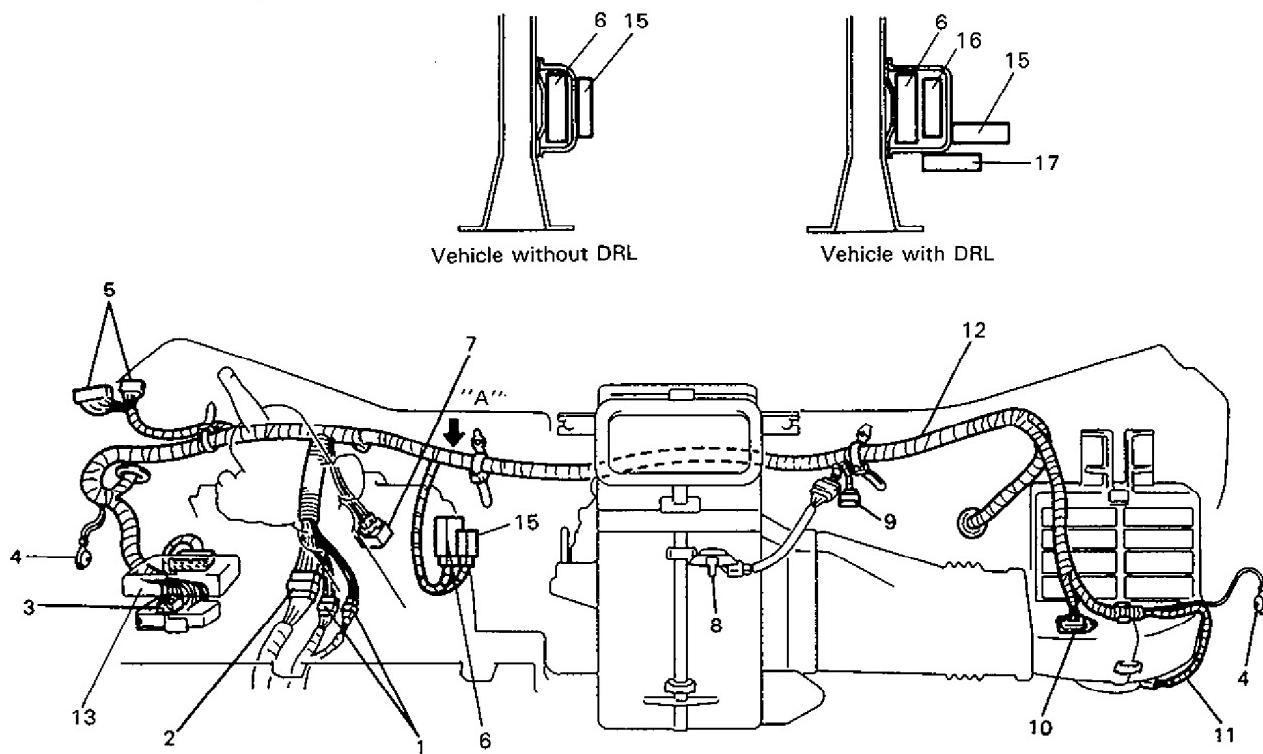
"B" terminal wire should not touch to cylinder block, water intake pipe or generator bracket.

- | | |
|---|---------------------------------|
| 1. To transmission wiring harness | 8. Water temperature gauge |
| 2. To transmission wiring harness (For A/T model) | 9. Generator "B" terminal wire |
| 3. Oil pressure switch | 10. Injector |
| 4. Ground | 11. I.S.C. solenoid valve |
| 5. Generator | 12. Throttle position sensor |
| 6. Starter | 13. Engine wiring harness No. 5 |
| 7. V.S.V. | 14. Stiffener |
| | 15. Water temperature sensor |

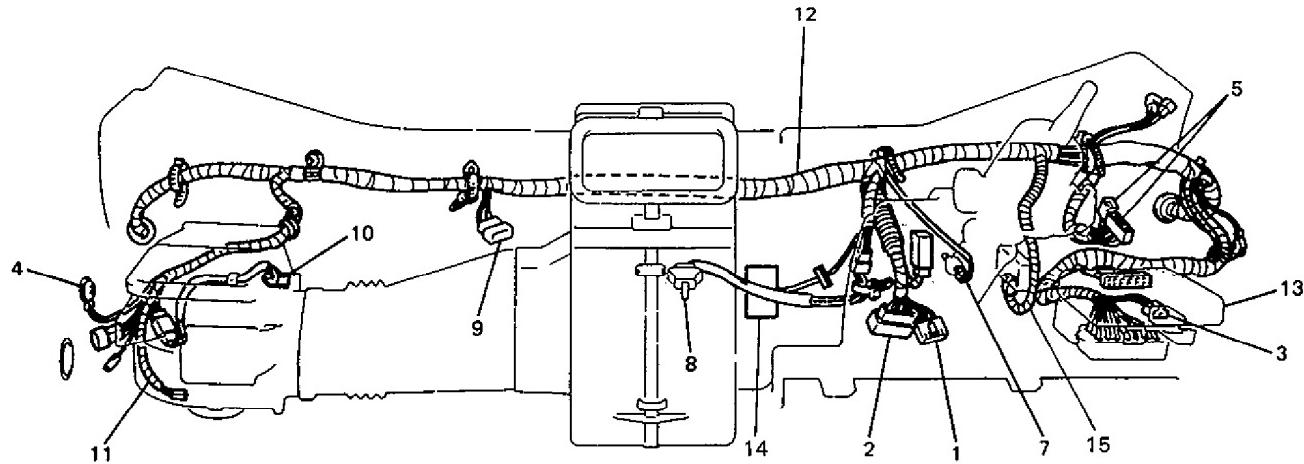
COWL UPPER WIRING

For left hand steering vehicle

VIEW FROM "A"



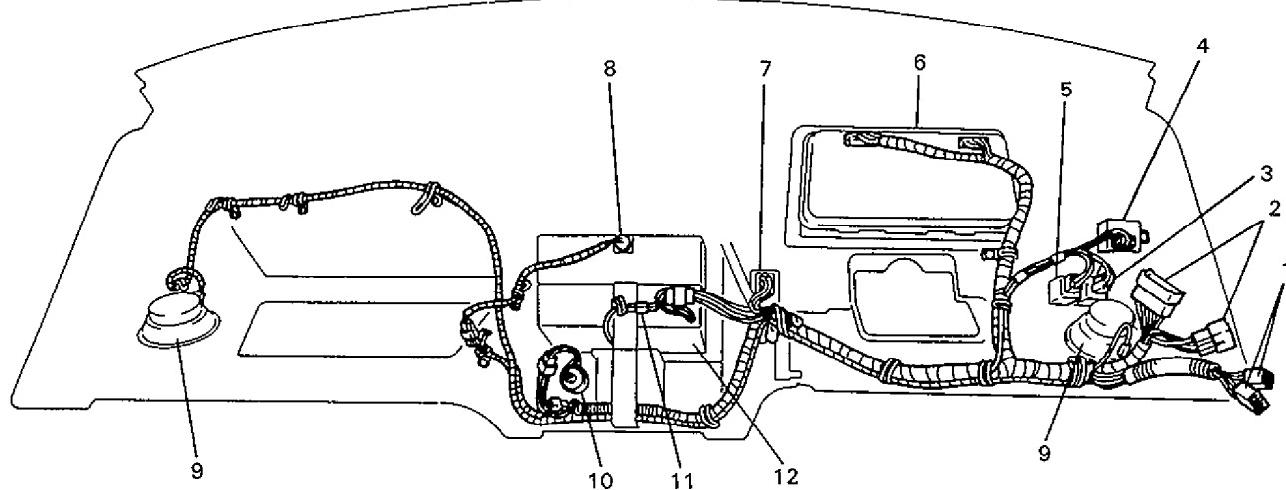
For right hand steering vehicle



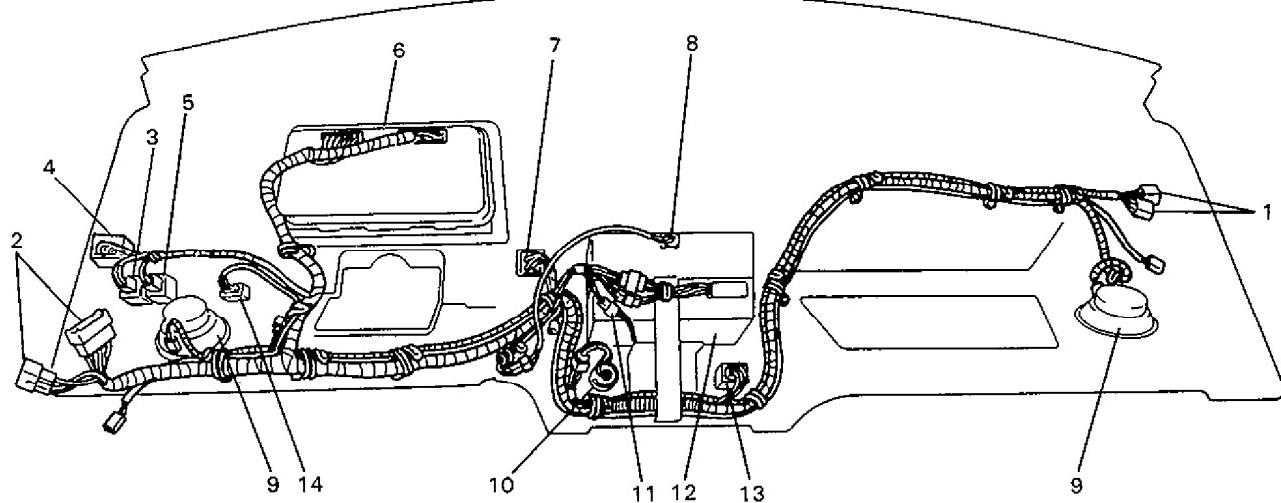
- | | |
|--|------------------------------------|
| 1. To main switch | 10. Blower resistor |
| 2. Combination switch | 11. To blower motor |
| 3. To turn relay | 12. Main wiring harness No.1 |
| 4. Ground | 13. ECM |
| 5. To instrument panel wiring harness No.2 | *14. Dim-Dip controller |
| *6. A/T controller | *15. Door lock controller |
| 7. Brake light switch | *16. DRL controller |
| 8. Blower speed selecting switch | *17. Head light cleaner controller |
| 9. To A/C wiring harness (Optional) | |

INSTRUMENT PANEL WIRING

For left hand steering vehicle

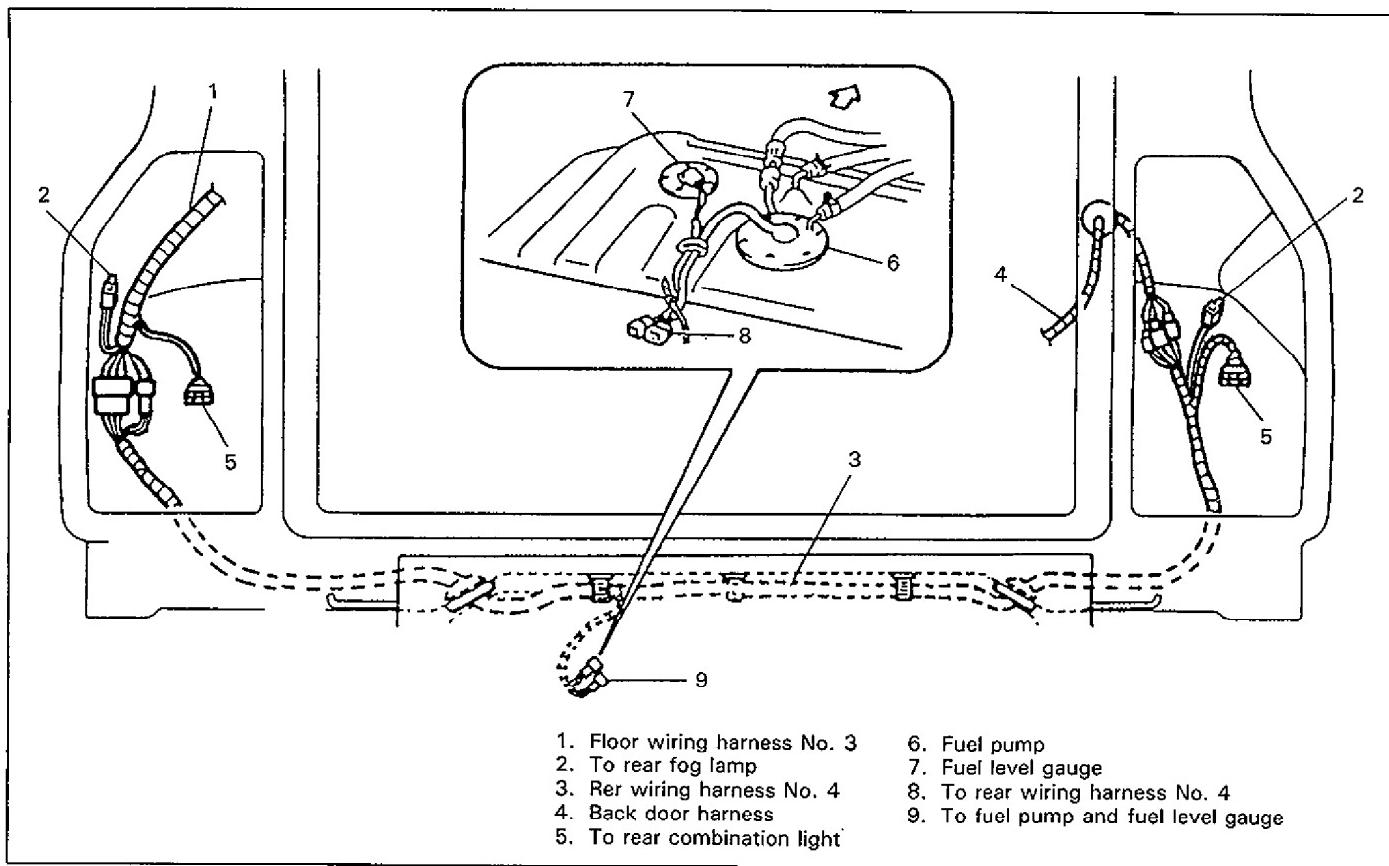


For right hand steering vehicle



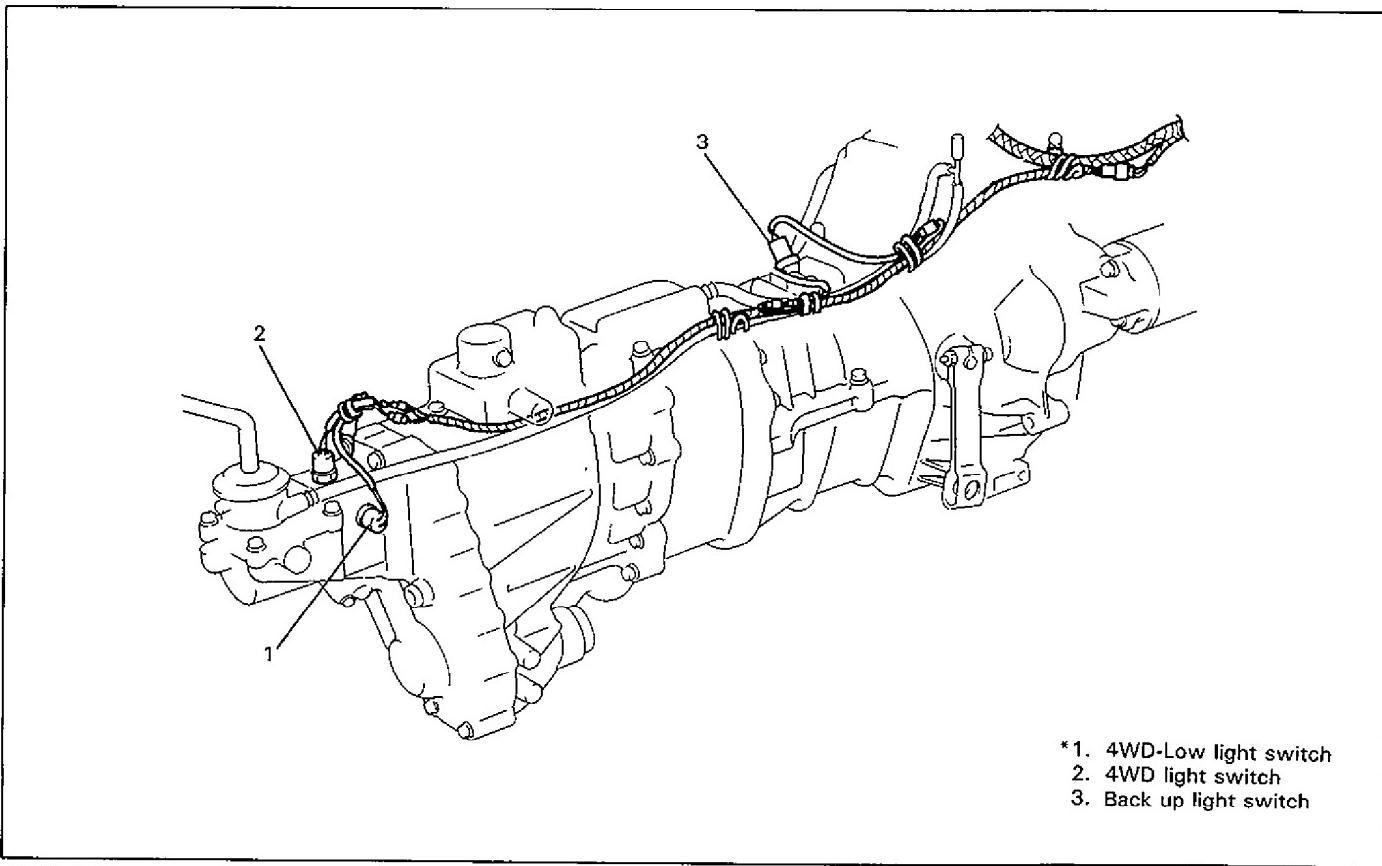
- | | |
|----------------------------------|---------------------------------|
| 1. To floor wiring harness No. 3 | 8. Control panel light |
| 2. To main wiring harness No. 1 | 9. Front speaker |
| *3. Illumination control switch | *10. Cigarette lighter |
| *4. Warning buzzer | 11. To ashtray light |
| *5. Rear defogger switch | 12. Radio (Optional) |
| 6. Speedometer | *13. Clock |
| *7. Rear wiper washer switch | 14. Mirror switch (If equipped) |

REAR WIRING



60A50-8-38-1S

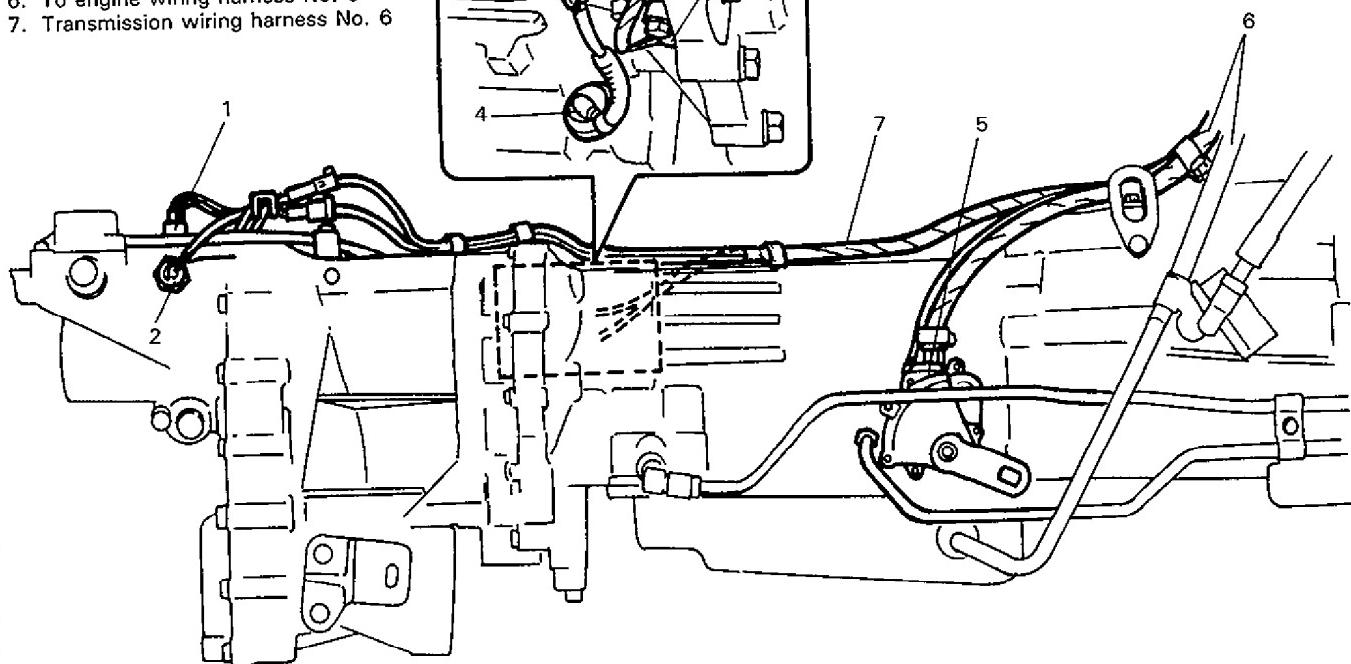
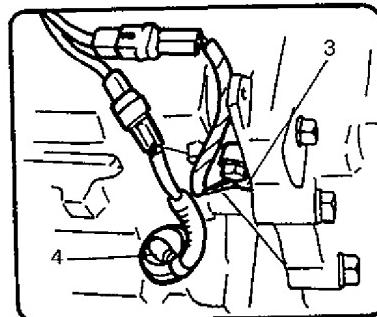
MANUAL TRANSMISSION WIRING



60A50-8-38-2S

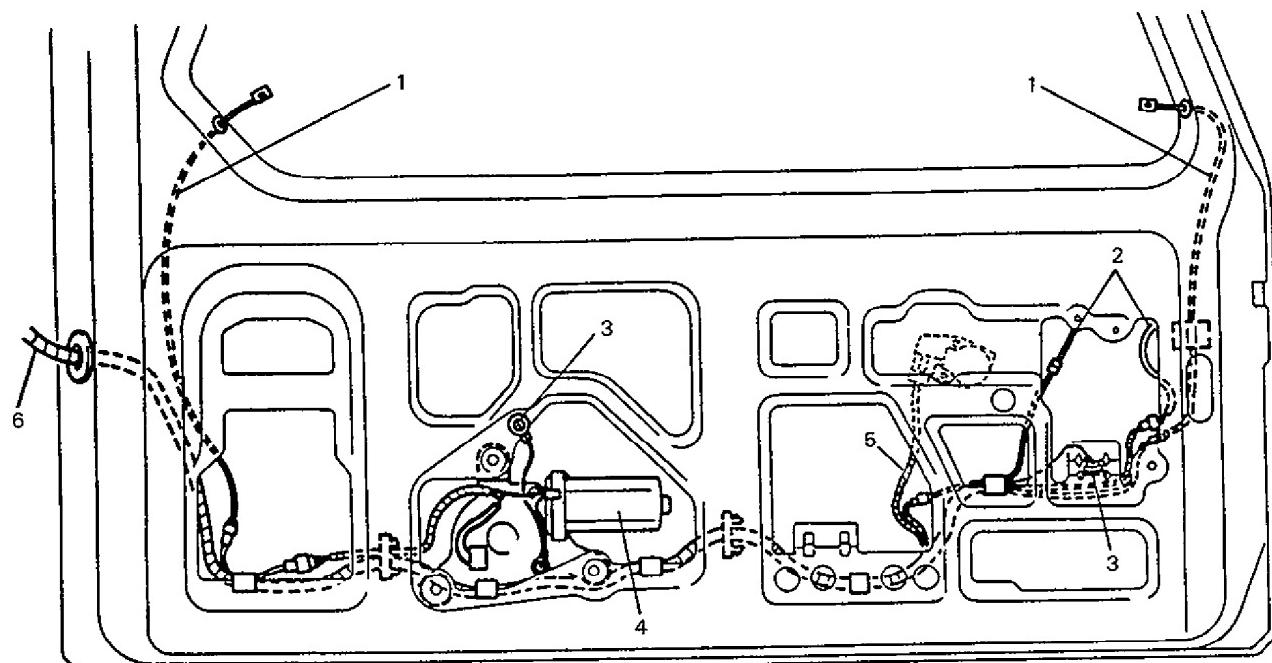
AUTOMATIC TRANSMISSION WIRING

1. 4WD switch
2. 4WD-Low switch
3. Speed sensor
4. Shift solenoid
5. Shift switch
6. To engine wiring harness No. 5
7. Transmission wiring harness No. 6



60A50-8-39-1S

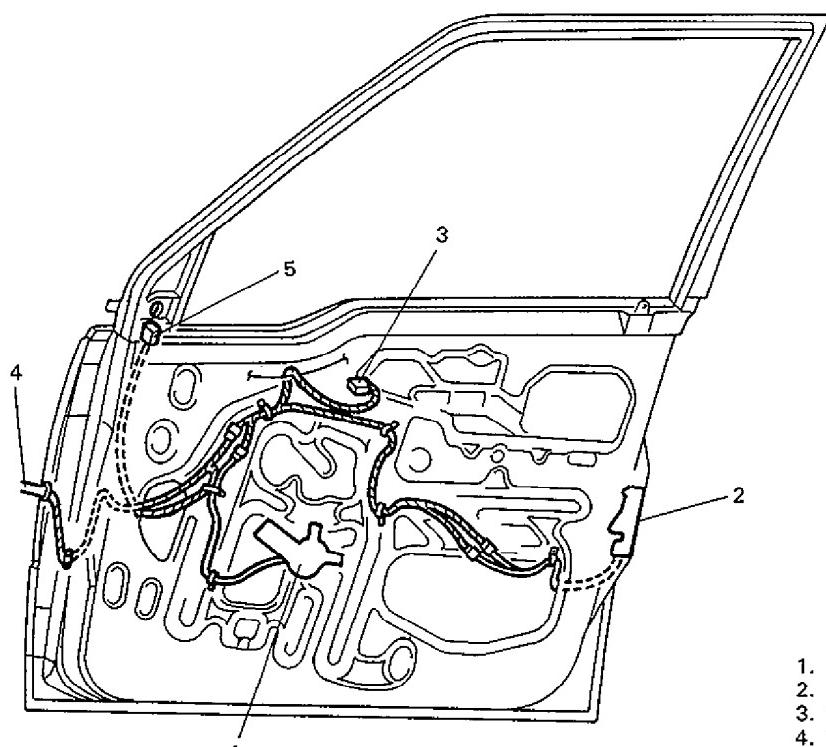
BACK DOOR WIRING



- | | |
|--------------------------|---------------------------------|
| 1. Rear defogger harness | 4. Rear wiper motor |
| 2. To license light | 5. To back door opener solenoid |
| 3. Ground | 6. To rear wiring harness No. 4 |

60A50-8-39-2S

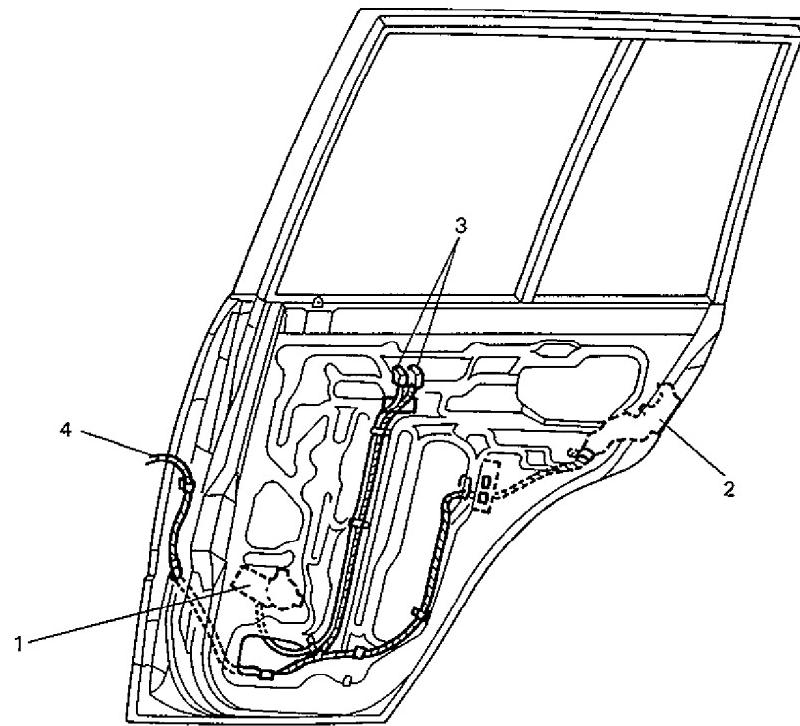
FRONT DOOR WIRING



1. Power window regulator
2. Power door lock
3. To door switch
4. To floor harness
5. To mirror motor

60A50-8-40-1S

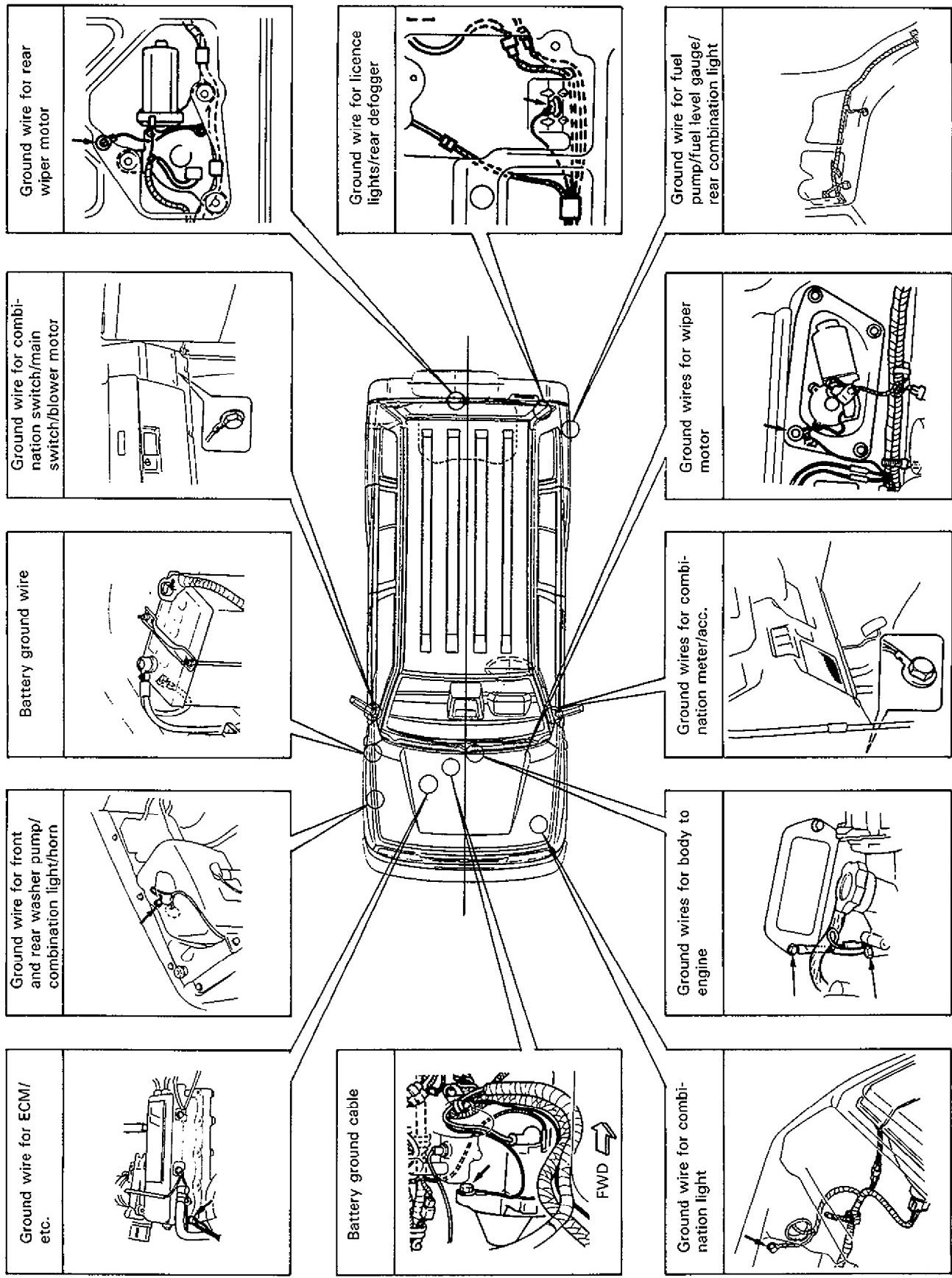
REAR DOOR WIRING



1. Power window regulator
2. Power door lock
3. To door switch
4. To floor harness

60A50-8-40-2S

GROUND POINTS



WIRING DIAGRAM

Wiring diagrams (1—10) are attached at the end of this manual.

Right Hand Steering Vehicle with M/T	1
Right Hand Steering Vehicle with A/T	2
Vehicle with DRL (Daytime Running Light) system and M/T	3
Vehicle with DRL (Daytime Running Light) system and A/T	4
German Specifications Vehicle with M/T	5
German Specifications Vehicle with A/T	6
Saudi Arabian Specifications Vehicle with M/T	7
Saudi Arabian Specifications Vehicle with A/T	8
Other Specifications Vehicle with M/T	9
Other Specifications Vehicle with A/T	10

60A50-8-42-1S

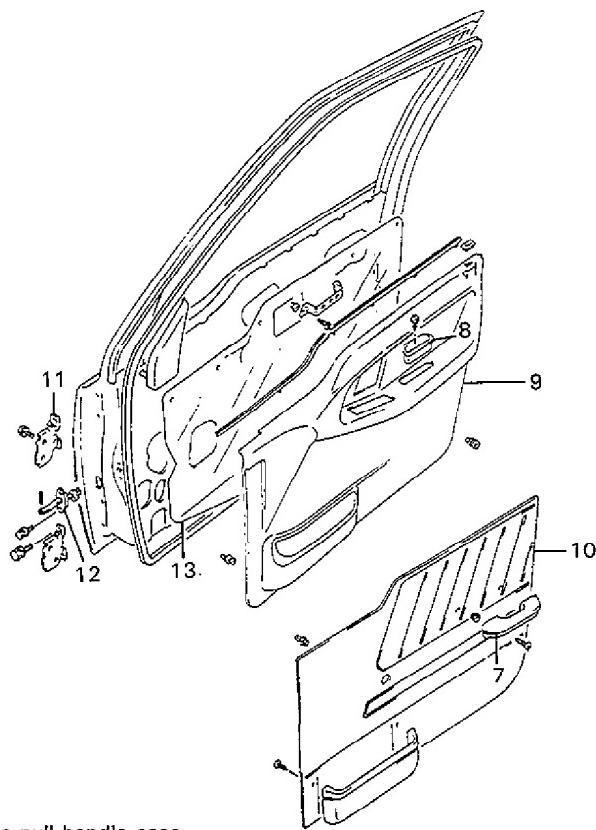
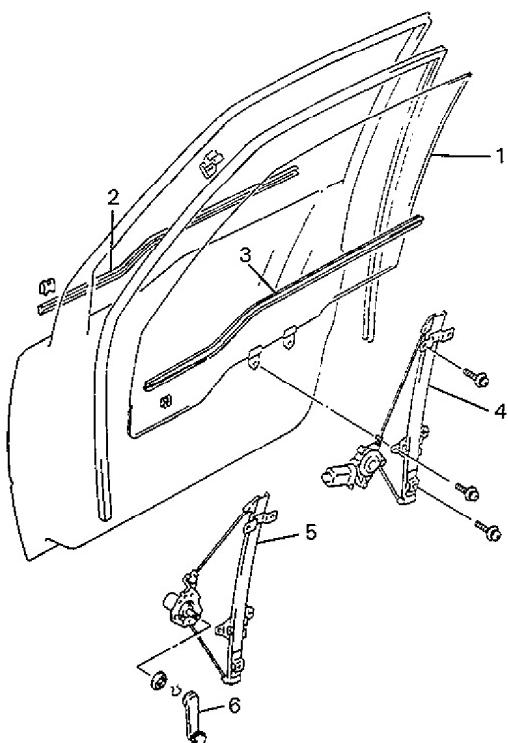
SECTION 9

BODY SERVICE

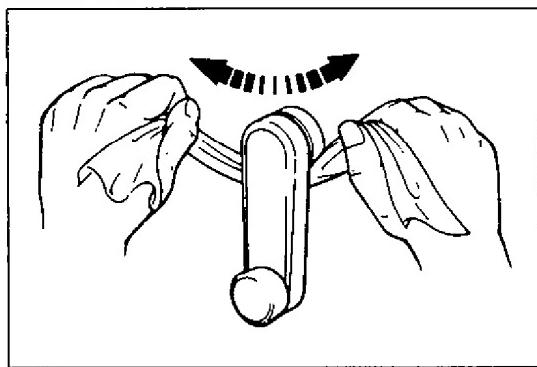
CONTENTS

FRONT DOOR	9- 2	OUTSIDE REAR VIEW MIRROR	9-19
Door Glass	9- 2	WINDSHIELD	9-20
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Rear Door Assembly.....	9-16	IGNITION SWITCH LOCK CYLINDER	9-43
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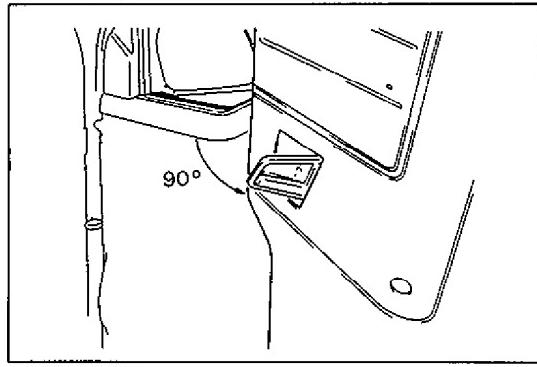
FRONT DOOR



60A50-9-2-1S



60A50-9-2-4S



DOOR GLASS

REMOVAL

1. Remove inside handle bezel.

2. Remove door armrest.

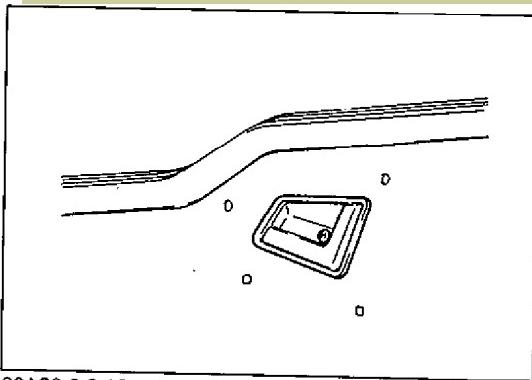
3. Remove window regulator handle.

To remove regulator handle, pull off snap ring by using a cloth as shown.

4. Remove door trim.

With inside handle bezel tilted as shown in figure, turn door trim 90° counterclockwise to remove it.

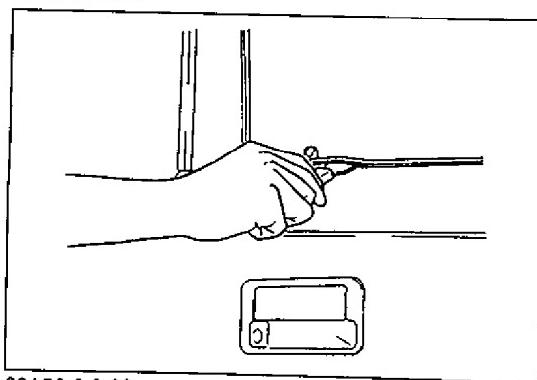
60A50-9-2-5S



60A50-9-3-1S

5. Remove door sealing cover.

Fit inside handle bezel back into specified place of door panel.



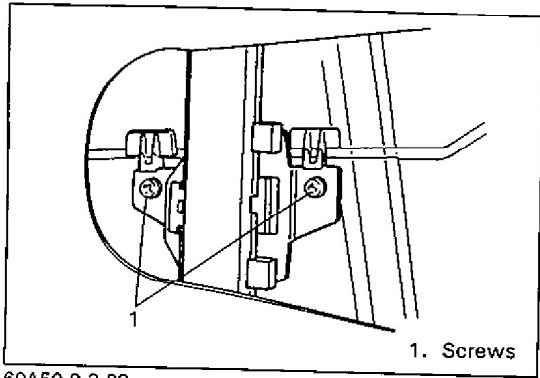
60A50-9-3-2S

6. Remove door outside weatherstrip.

Lower window all the way down. Then, use a tape-wrapped putty knife (or screwdriver) to pry off weatherstrip.

CAUTION:

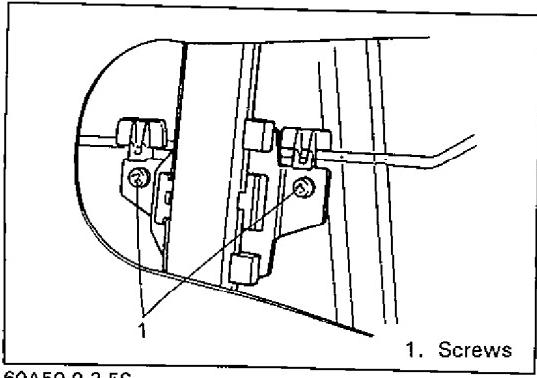
Use a tape-wrapped putty knife (or screwdriver) to pry off weatherstrip. Use of an unwrapped tool will cause damage to painting.



60A50-9-3-3S

7. Remove glass attaching screws.

8. Take out door glass.

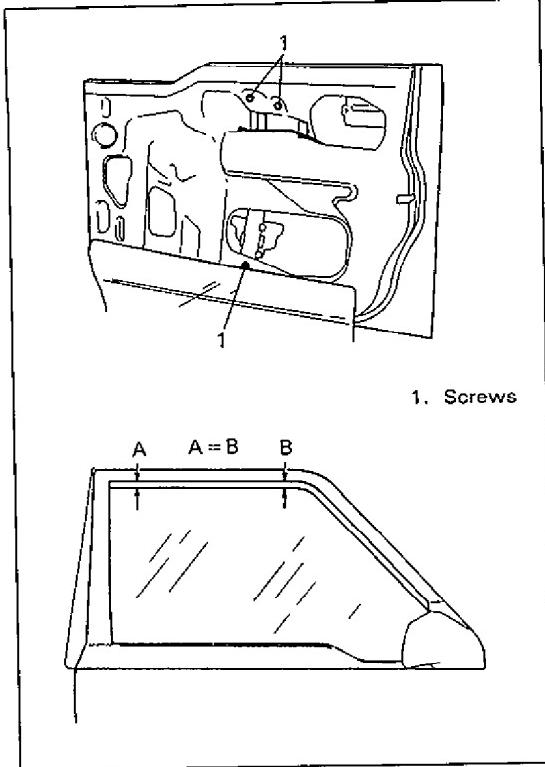


60A50-9-3-5S

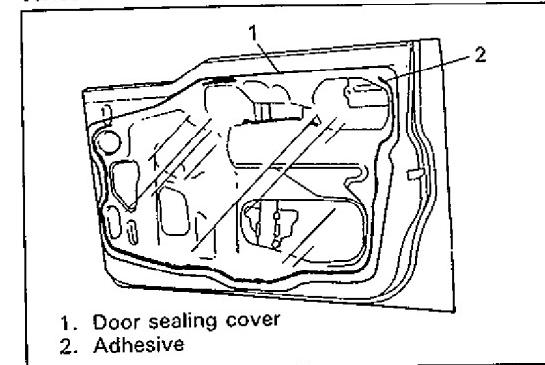
INSTALLATION

Reverse removal procedure to install door glass noting following points:

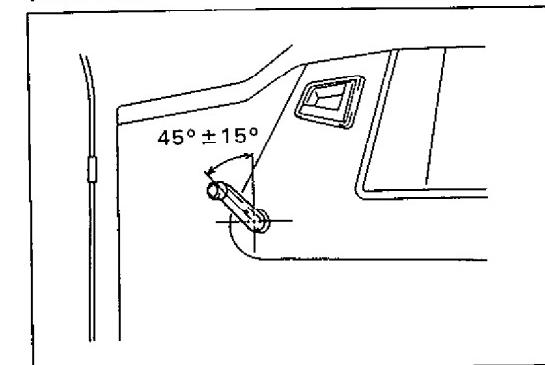
1. When window becomes hard to raise and lower, it is possible that glass is tilted toward door sash.



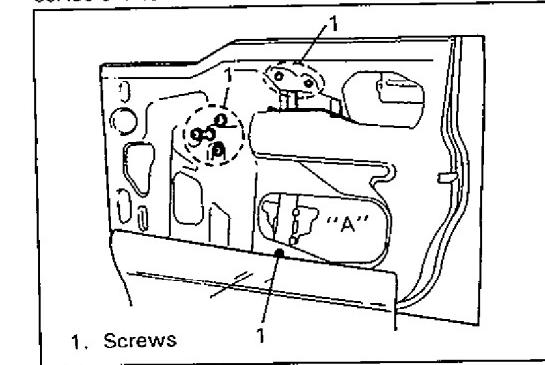
60A50-9-4-1S



60A50-9-4-3S



60A50-9-4-4S



60A50-9-4-5S

2. Adjust equalizer of window regulator so that measurement A and B are equal.

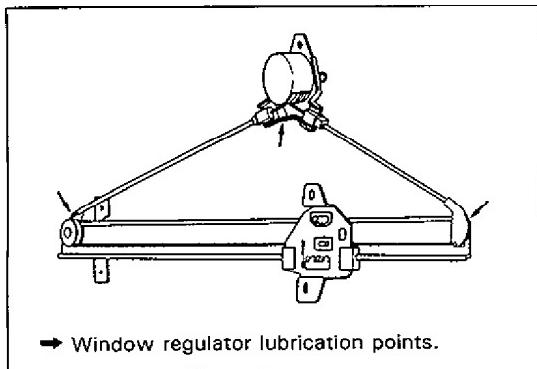
3. Secure door sealing cover with adhesive.

4. Install door window regulator handle so that it has an angle as shown when glass is fully closed.

WINDOW REGULATOR

REMOVAL

1. Remove door glass, referring to Front Door Glass Removal in this section.
2. Loosen 6 screws and take out regulator through hole "A".



60A50-9-5-1S

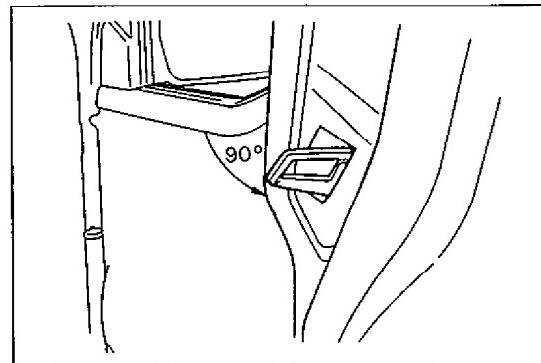
INSPECTION

1. Check regulator sliding and rotating parts for greasing.
2. Check rollers for wear and damage.
3. Check wire for damage.

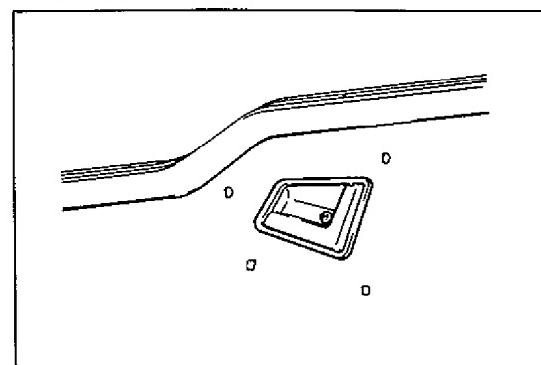
INSTALLATION

Reverse removal procedure to install window regulator.

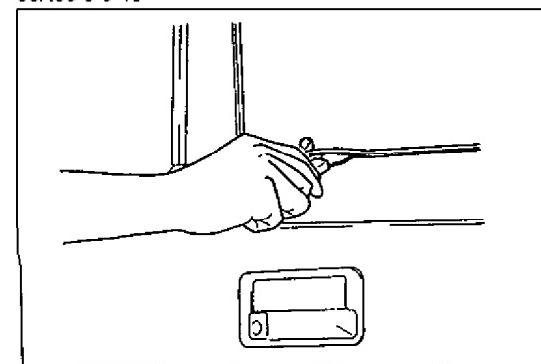
60A50-9-5-2S



60A50-9-5-3S



60A50-9-5-4S

**DOOR GLASS**

(Vehicle equipped with power window)

REMOVAL

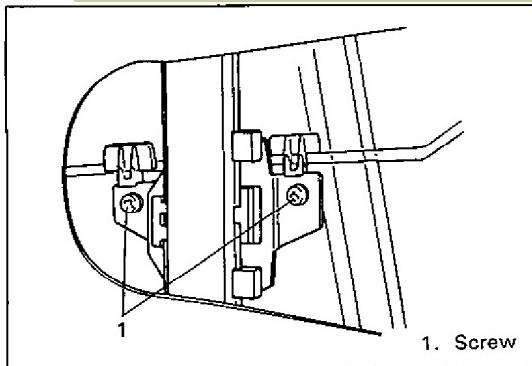
1. Lower window all the way down.
2. Remove inside handle bezel.
3. Remove door inside pull handle case.
4. Remove door trim with inner weatherstrip. With inside handle bezel tilted as shown in figure, turn door trim 90° counterclockwise to remove it.
5. Remove door sealing cover, and fit inside handle bezel back into specified place of door panel.

6. Remove door outside weatherstrip.

CAUTION:

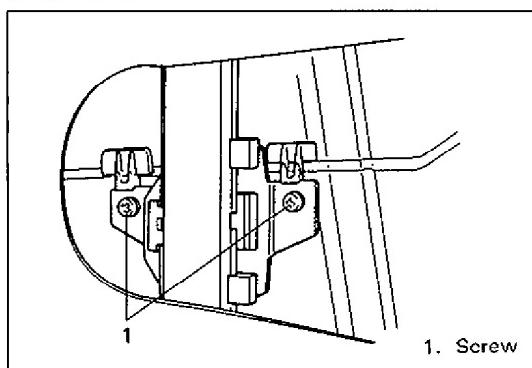
Use a tape-wrapped putty knife (or screw driver) to pry off weatherstrip. Use of an unwrapped tool will cause damage to painting.

60A50-9-5-5S



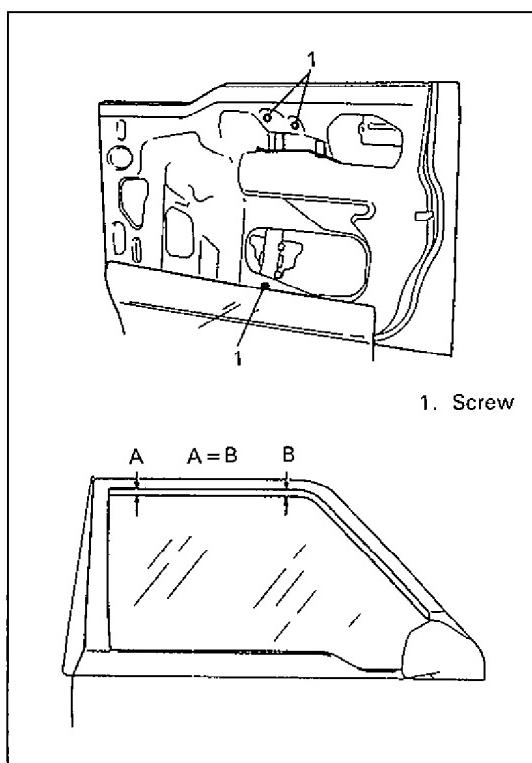
60A50-9-6-1S

7. Raise window up to such position where 2 screws can be turned.
8. Remove glass attaching screws.
9. Take out door glass.



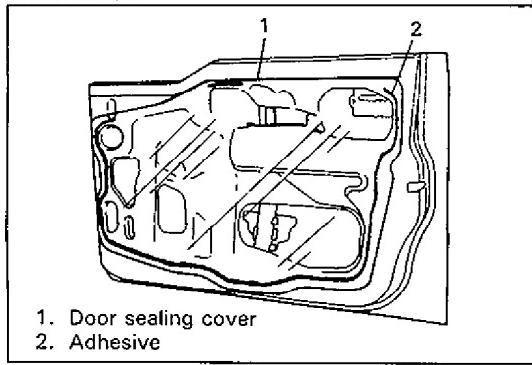
60A50-9-6-2S

2. Adjust equalizer of window regulator so that measurements A and B as shown are equal.

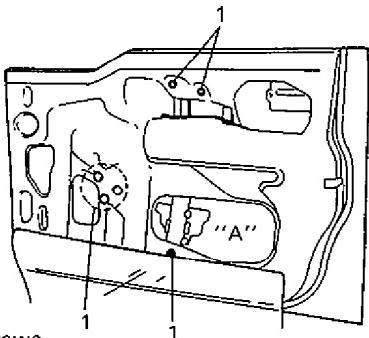


60A50-9-6-3S

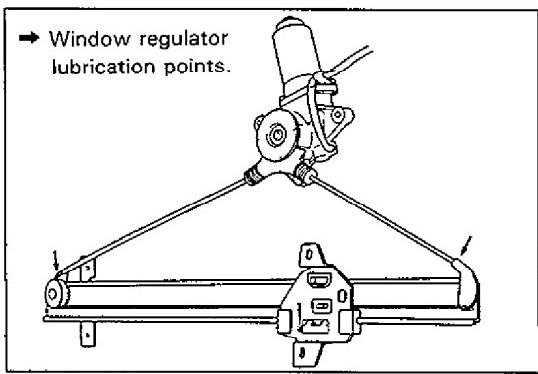
3. Secure door sealing cover with adhesive.



60A50-9-6-5S



60A50-9-7-1S



60A50-9-7-2S

WINDOW REGULATOR (Vehicle equipped with power window)

REMOVAL

1. Remove door glass, referring to Front Door Glass Removal in this section.
2. Disconnect power window motor lead wire.
3. Loosen 6 screws and take out regulator with motor through hole "A".

INSPECTION

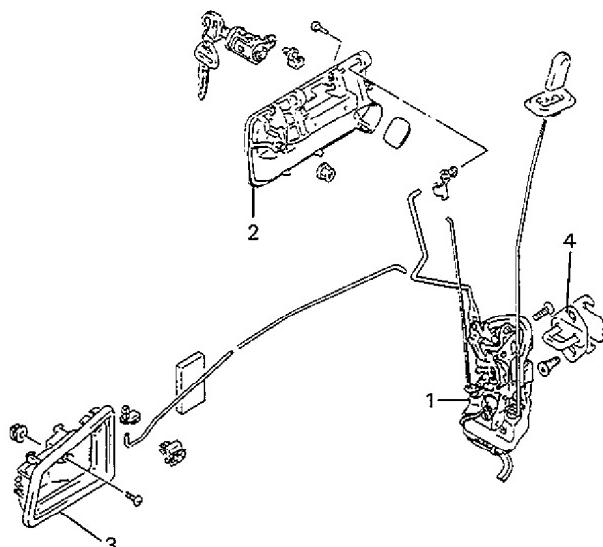
1. Check regulator sliding and rotating parts for greasing.
2. Check rollers for wear and damage.
3. Check wire for damage.

INSTALLATION

Reverse removal procedure to install window regulator.

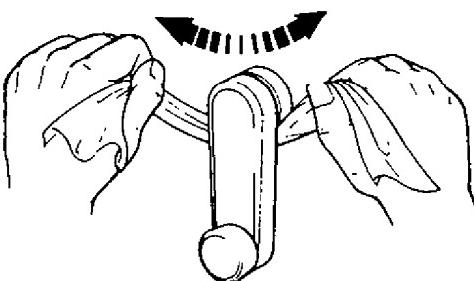
60A50-9-7-3S

LOCK ASSEMBLY



1. Door latch
 2. Outside handle
 3. Inside handle bezel
 4. Latch striker

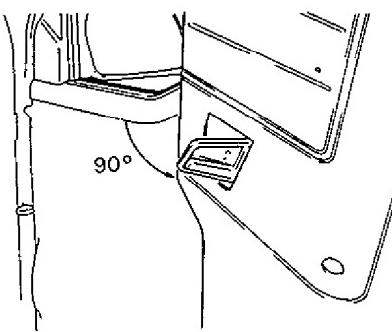
60A50-9-8-1S



REMOVAL

1. Raise window all the way up.
2. Remove inside handle bezel.
3. Remove door armrest.
4. Remove window regulator handle (If equipped).
To remove regulator handle, pull off snap ring by using a cloth as shown.

60A50-9-8-3S

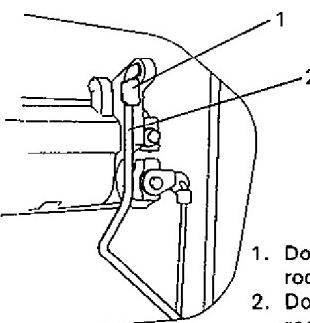


5. Remove door trim.

With inside handle bezel tilted as shown in figure below, turn door trim 90° counterclockwise to remove it.

6. Disconnect power window switch wire (If equipped).
7. Remove door sealing cover.

60A50-9-8-4S

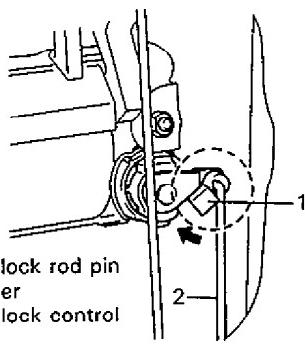


1. Door opening control rod pin retainer
 2. Door opening control rod

8. Remove door opening control rod.

Unlock door lock rod pin retainer and disconnect control rod.

60A50-9-8-5S



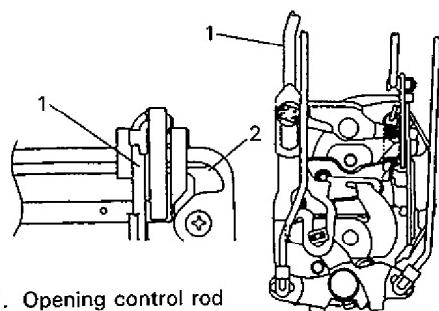
60A50-9-9-1S

9. Remove door lock control rod.

Unlock door lock rod pin retainer and disconnect control rod.

10. Disconnect door lock motor lead wire (if equipped).

11. Remove lock assembly.

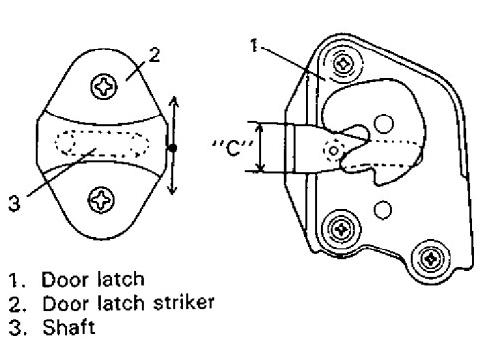


60A50-9-9-2S

INSTALLATION

To install front door lock, reverse removal procedure, noting following.

1. Install opening control rod as shown.



60A50-9-9-3S

2. Door latch striker.

Move door latch striker up or down so its center aligns with the center of groove "C" on the door, as shown.

NOTE:

Striker should be moved vertically and placed level. Do not adjust door lock.

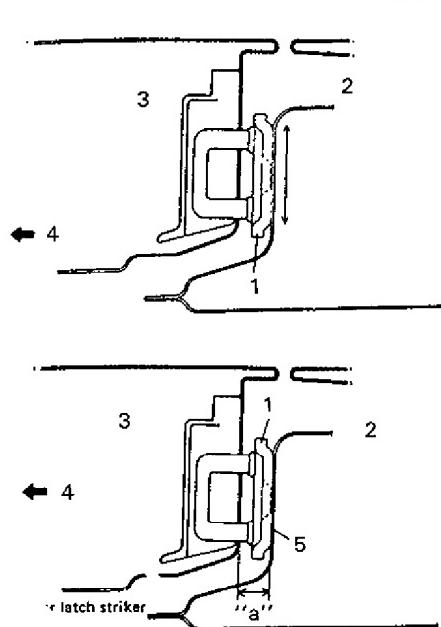
Move door latch striker sideways to adjust door surface flush with body surface, as shown.

In order to correctly obtain door latch striker position in the fore-and-aft direction, increase or decrease number of shims inserted between body and striker to adjust it.

Dimension "a": 12.6–14.6 mm (0.50–0.57 in.)

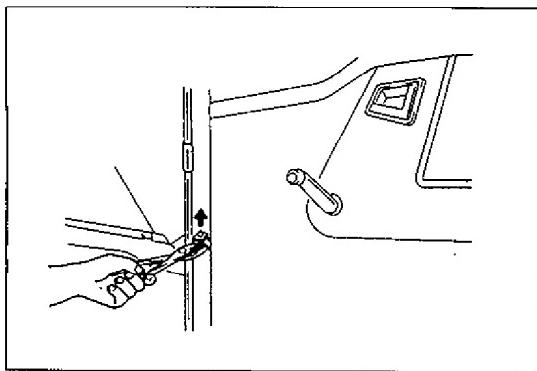
NOTE:

Apply oil or grease to striker joints periodically.

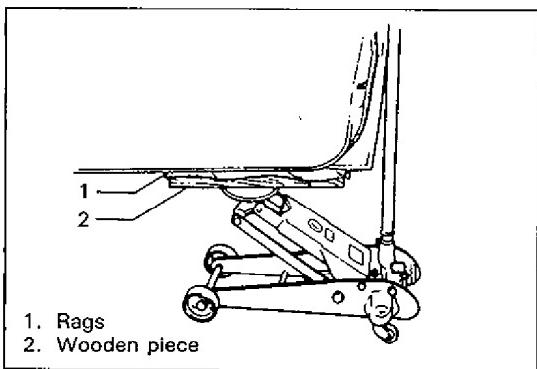


1. Door latch striker 4. Front side
2. Body 5. Shim
3. Door

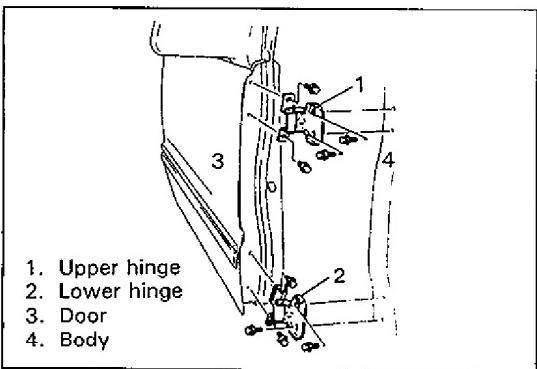
60A50-9-9-4S



60A50-9-10-1S



60A50-9-10-2S



60A50-9-10-3S

DOOR ASSEMBLY

REMOVAL

1. Remove door trim and sealing cover (referring to steps 2) to 4) on p. 9-5) and disconnect power window and central door lock harnesses at their couplers (if equipped).
2. Remove stopper pin.

3. Support door panel using a jack with a piece of wood placed between jack and panel, as shown.

4. Remove hinge-to-door bolts.

INSTALLATION

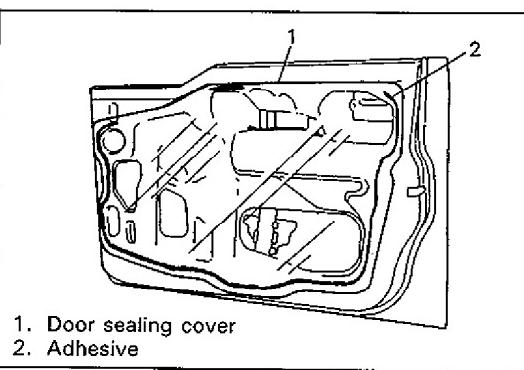
Reverse removal procedure to install door assembly.

NOTE:

When replacing door, coat replacement door inside with wax for proper anticorrosive treatment.

Refer to "ANTI-CORROSION TREATMENT" in this section.

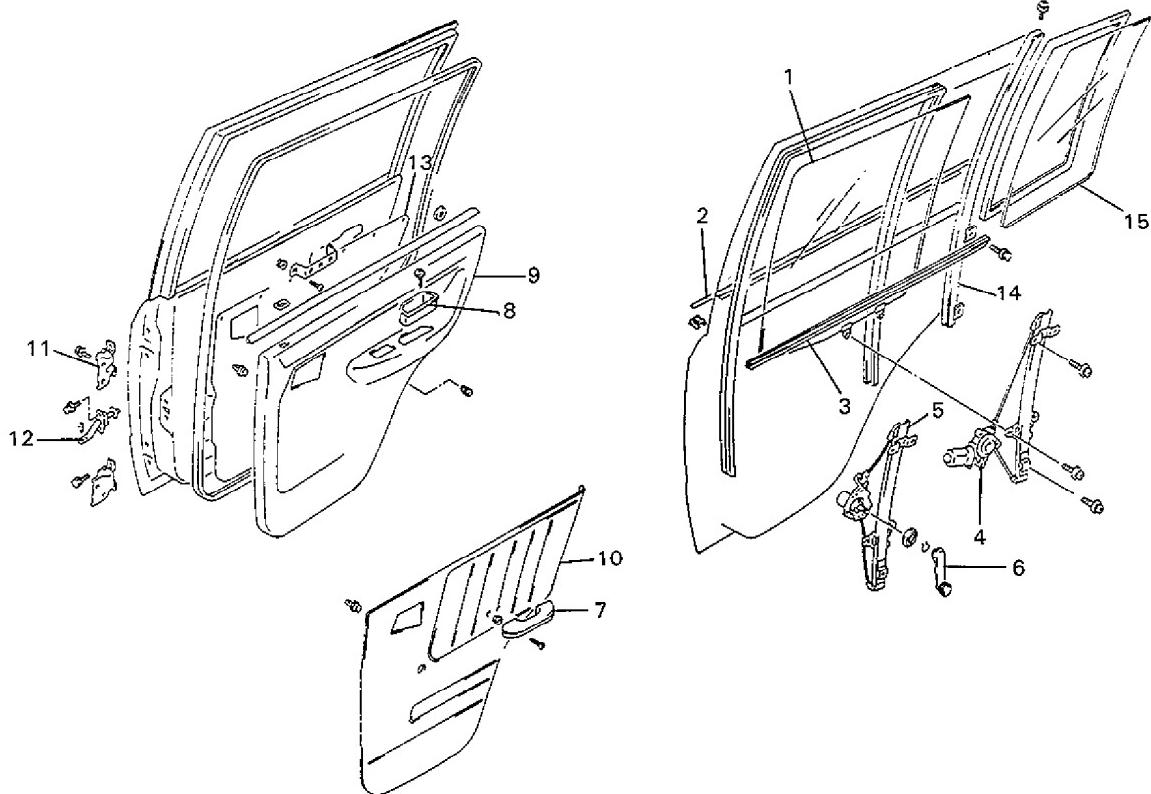
60A50-9-10-4S



60A50-9-10-5S

1. Apply sealing compound to inside peripheral of door hem area and reinstall door sealing cover.
2. When weatherstrip is hardened and water leaks have developed, replace it.

REAR DOOR

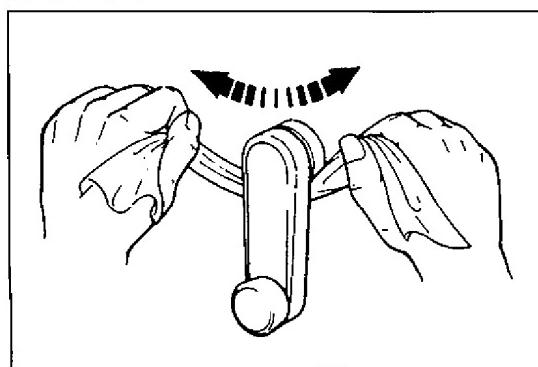


60A50-9-11-1S

DOOR GLASS

REMOVAL

1. Remove inside handle bezel fitting screw.
2. Remove door armrest.
3. Remove window regulator handle.
For its removal, pull off snap by using cloth as shown.
4. Remove door trim.
5. Remove door sealing cover.
6. Remove outer weatherstrip.

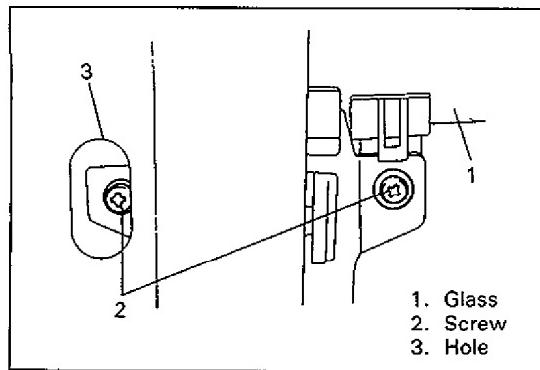


60A50-9-11-4S

CAUTION:

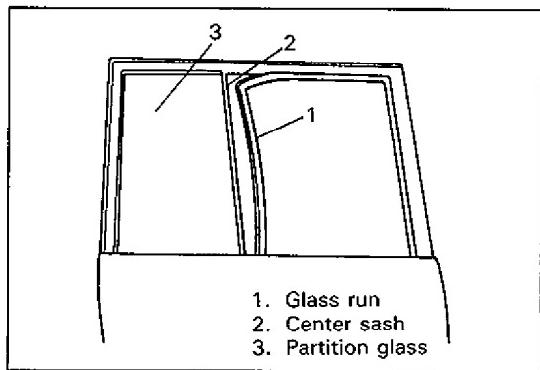
Using a tape-wrapped putty knife (or tape-wrapped screwdriver), pry off weatherstrip. Use of an unwrapped tool will cause damage to painting.

60A50-9-11-5S



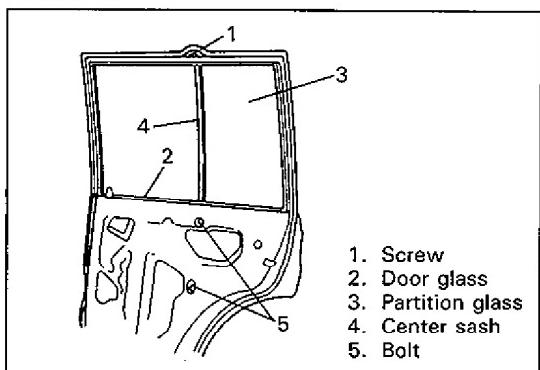
60A50-9-12-1S

7. Remove glass fitting screws. Then down door glass.



60A50-9-12-2S

8. Detach rear part of glass run from center sash.

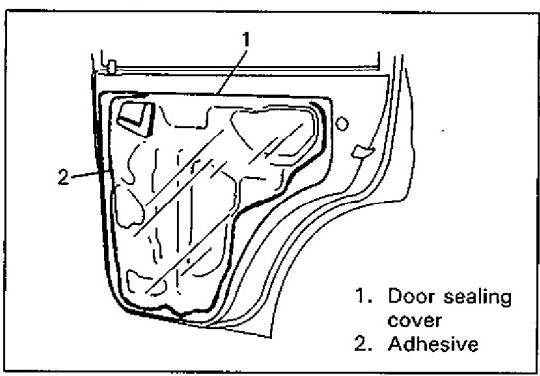


60A50-9-12-3S

9. Remove door center sash (by removing two bolts and a screw with door glass lowered all the way down).

10. When remove partition glass, slide to front to remove it.

11. Take out glass.



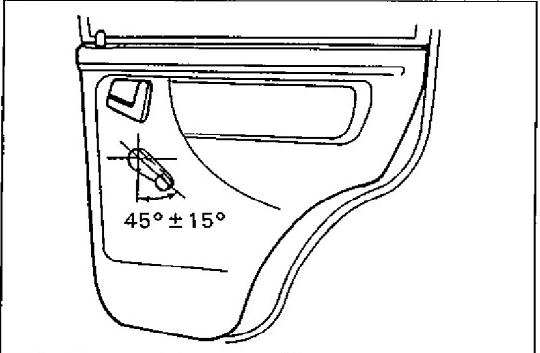
60A50-9-12-4S

INSTALLATION

Reverse removal sequence to install door glass.

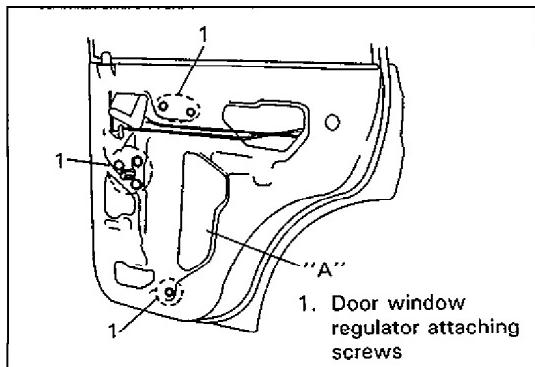
However, be careful of following points.

1. Securely seal door sealing cover with adhesive.

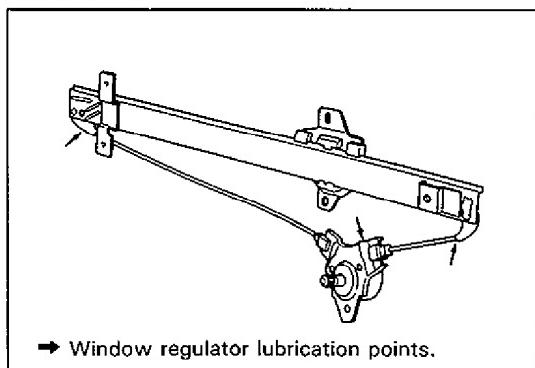


60A50-9-12-5S

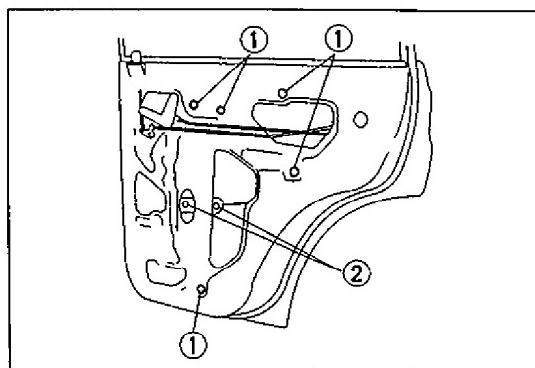
2. Install door window regulator handle so that it has an angle as shown when glass is fully closed.



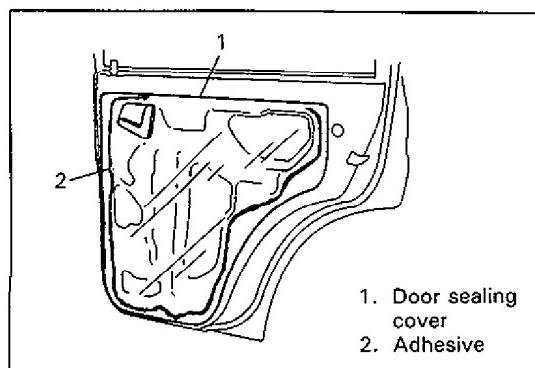
60A50-9-13-1S



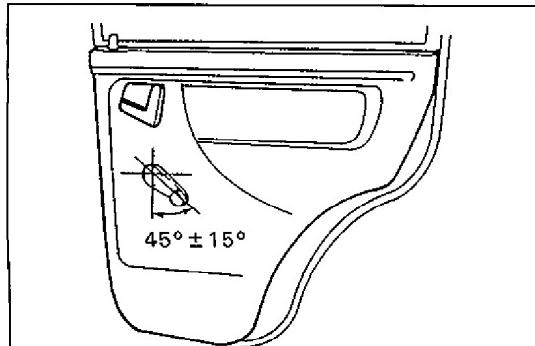
60A50-9-13-2S



60A50-9-13-3S



60A50-9-13-4S



2017-0-18-12

DOOR WINDOW REGULATOR

REMOVAL

1. Remove door glass. (See previous section).
 2. Remove door window regulator attaching screw (6 pcs), and take out regulator through hole "A".

INSPECTION

1. Check regulator sliding and rotating parts for greasing.
 2. Check rollers for wear and damage.
 3. Check wire for damage.

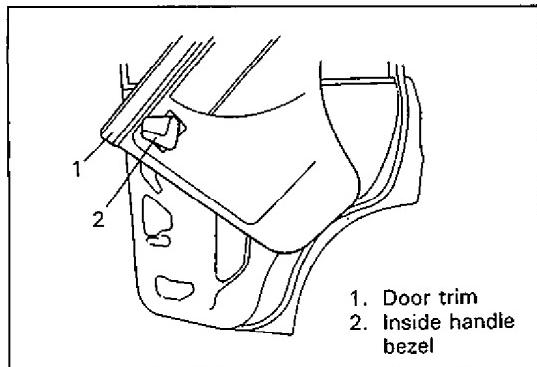
INSTALLATION

Reverse removal sequence to install door window regulator noting following points.

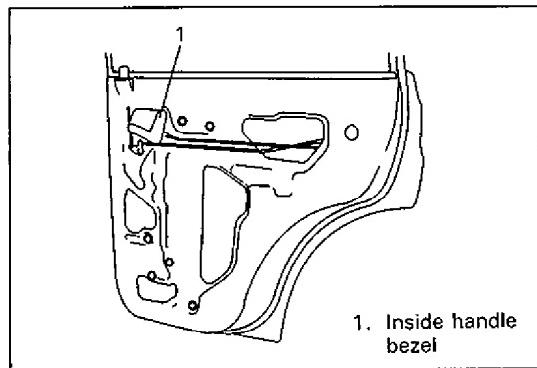
1. Adjust door window regulator according to following procedure.
 - a. Loosen five screws and two bolts shown below.
 - b. Raise window fully with regulator handle.
 - c. Tighten three screws ① and two bolts ①.
 - d. Lower window.
 - e. Tighten two screws ②.
 2. Securely seal door sealing cover with adhesive.

2. Securely seal door sealing cover with adhesive.

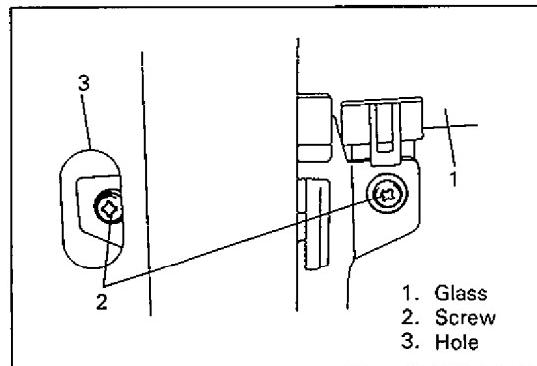
- 3. Install door window regulator handle so that it has an angle as shown when glass is fully closed.**



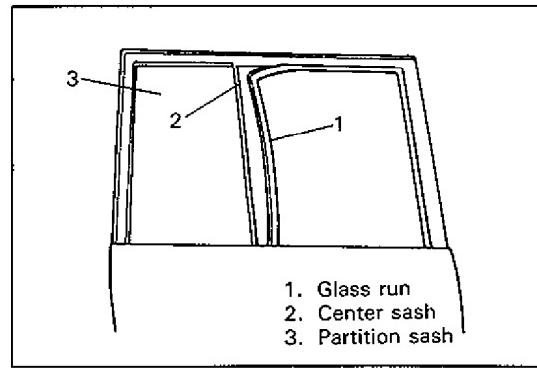
60A50-9-14-1S



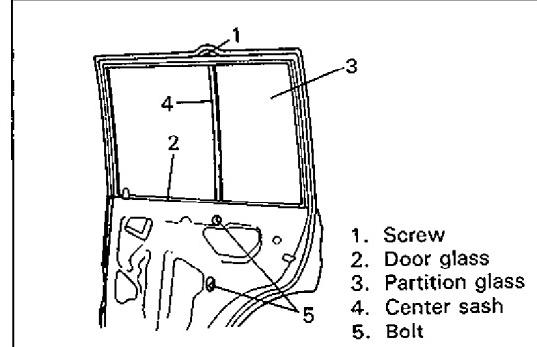
60A50-9-14-2S



60A50-9-14-3S



60A50-9-14-4S



60A50-9-14-5S

DOOR GLASS (Vehicle equipped with power window) REMOVAL

1. Lower window all the way down.
2. Remove inside handle bezel.
3. Remove door inside pull handle case.
4. Remove door trim with inner weatherstrip. With inside handle bezel tilted as shown in figure, turn door trim 90° counterclockwise to remove it, and disconnect power window switch wire.
5. Remove door sealing cover, and fit inside handle bezel back into specified place of door panel.
6. Remove outer weatherstrip.

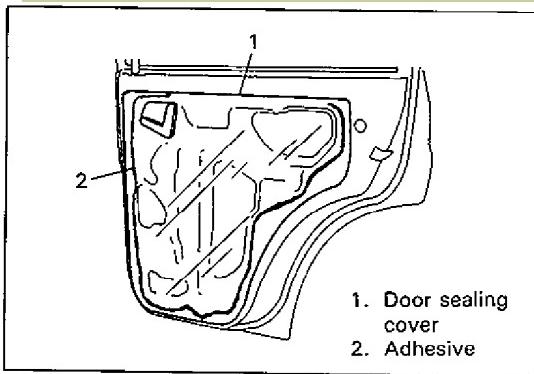
CAUTION:

Use a tape-wrapped putty knife (or screwdriver) to pry off weatherstrip. Use of an unwrapped tool will cause damage to painting.

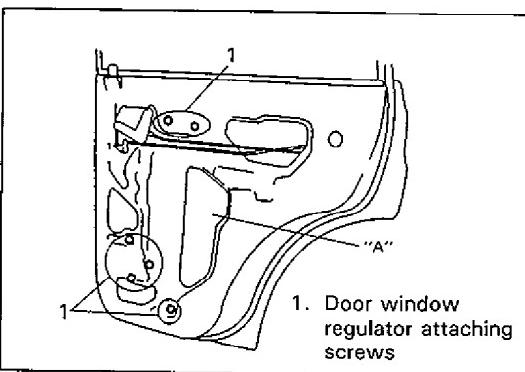
7. Remove glass fitting screws. Then down door glass.

8. Detach rear part of glass run from center sash.

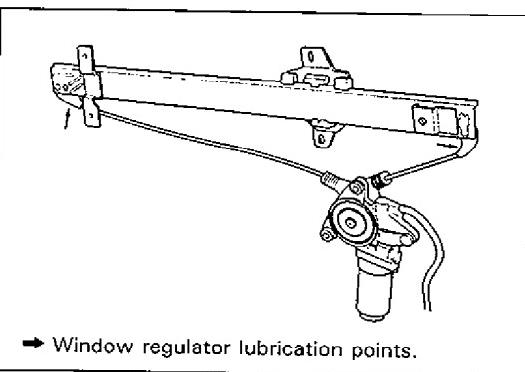
9. Remove door center sash (by removing two bolts and a screw with door glass lowered all the way down).
10. When remove partition glass, slide to front to remove it.
11. Take out glass.



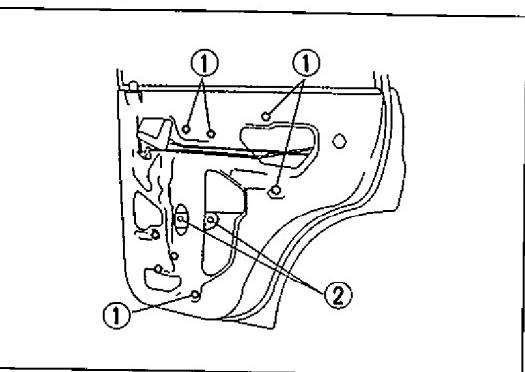
60A50-9-15-1S



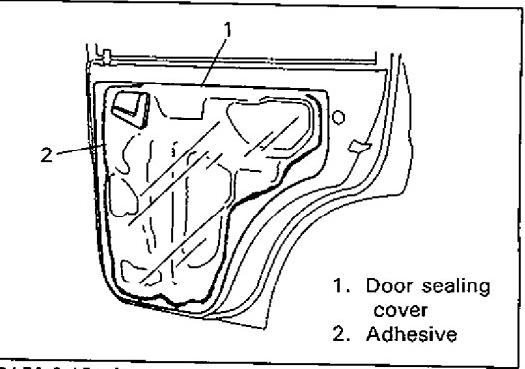
60A50-9-15-2S



60A50-9-15-3S



60A50-9-15-4S



60A50-9-15-5S

INSTALLATION

Reverse removal sequence to install door glass.
However, be careful of following point.

- Securely seal door sealing cover with adhesive.

WINDOW REGULATOR (Vehicle equipped with power window)

REMOVAL

- Remove door glass. (See previous section.)
- Disconnect power window motor wire.
- Remove 6 screws and take out regulator with motor through hole "A".

INSPECTION

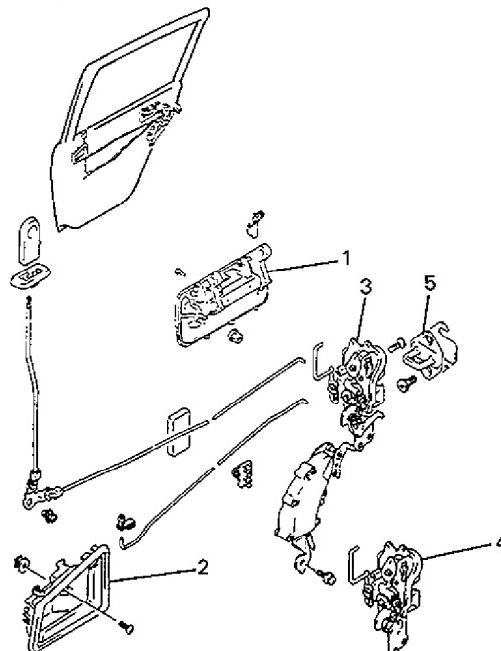
- Check regulator sliding and rotating parts for greasing.
- Check rollers for wear and damage.
- Check wire for damage.

INSTALLATION

Reverse removal sequence to install door window regulator noting following points.

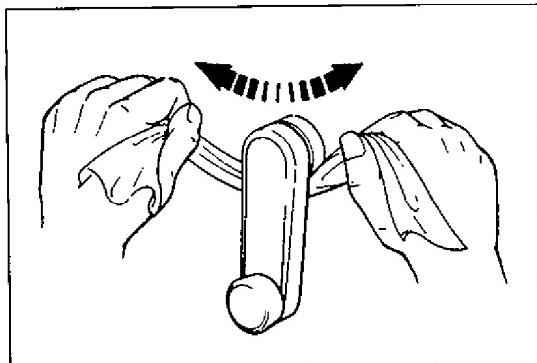
- Adjust door window regulator according to following procedure.
 - Loosen five screws and two bolts shown.
 - Raise window fully.
 - Tighten three screws ① and two bolts ①.
 - Lower window.
 - Tighten two screws ②.
- Securely seal door sealing cover with adhesive.

REAR DOOR LOCK ASSEMBLY



1. Outside handle
2. Inside handle bezel
3. Latch assembly (Vehicle equipped with power window)
4. Latch assembly
5. Latch striker

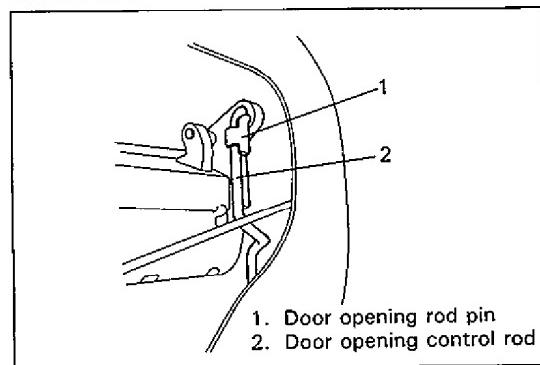
60A50-9-16-1S



REMOVAL

1. Remove inside handle bezel screw.
2. Remove door armrest or inside pull handle case.
3. Remove window regulator handle (If equipped). For its removal, pull off snap by using a cloth as shown.
4. Remove door trim.
5. Disconnect power door lock switch wire (If equipped).
6. Remove door sealing cover.

60A50-9-16-3S



7. Remove door opening control rod and door lock control rod.
8. Remove lock assembly.

60A50-9-16-4S

INSTALLATION

Reverse removal sequence to install rear door lock.

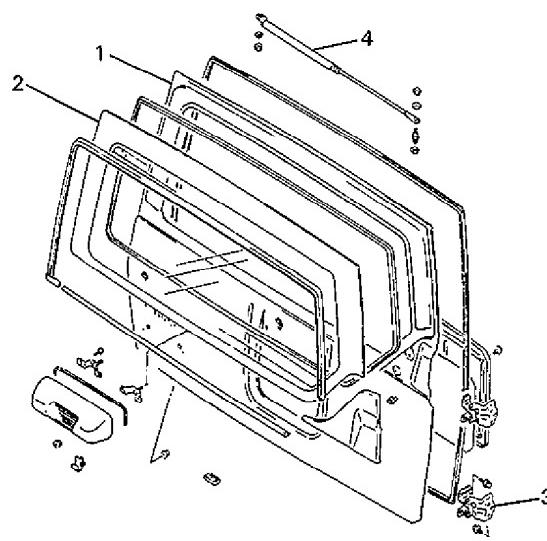
REAR DOOR ASSEMBLY

REMOVAL/INSTALLATION

Follow procedures for Front Door removal/installation in this section.

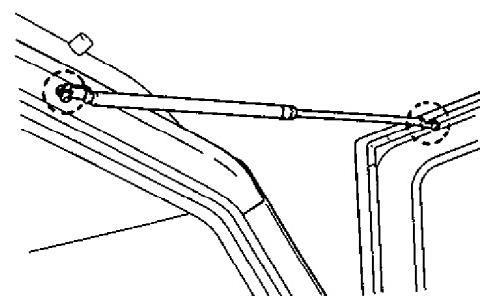
60A50-9-16-5S

BACK DOOR

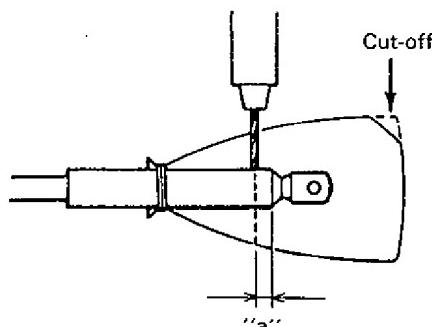


1. Back door panel ass'y
2. Back door window glass
3. Back door hinge
4. Back door balancer unit

60A50-9-17-1S



60A50-9-17-3S



REMOVAL

1. Remove door trim.
2. Remove sealing cover.
3. Remove wire harness connector inside the back door.
4. Remove back door balancer (first at its door-side and next at its body-side), as shown.

WARNING:

When handling back door balancer (damper), make sure to observe the following precautions.

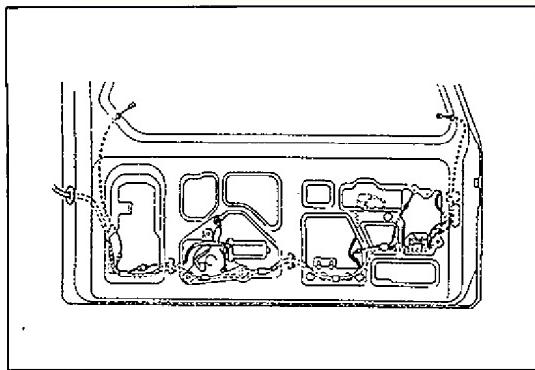
- 1) Don't disassemble it.
- 2) Don't put it into fire.
- 3) Don't store it where it gets hot.
- 4) When discarding removed back door balancer (damper), envelop it, as illustrated, a vinyl bag.

Then, use a 2 to 3 mm (0.08 to 0.12 in.) drill to make a hole through bag into damper, as shown.

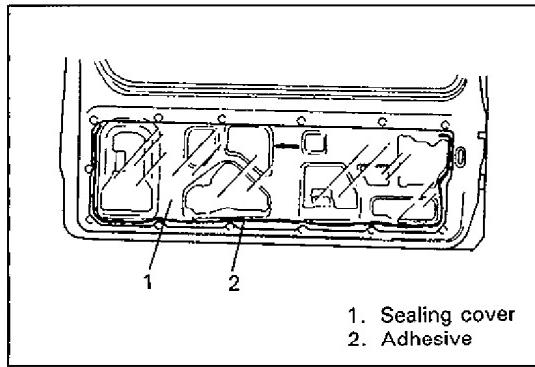
Handle damper carefully. Do not scar or scratch exposed surface of its piston rod, and never allow any paint or oil to stick to its surface. Do not turn piston rod with damper fully extended.

Dimension "a": 10 mm (0.4 in.)

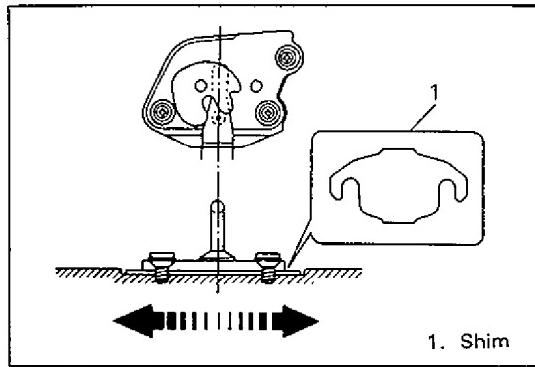
60A50-9-17-4S



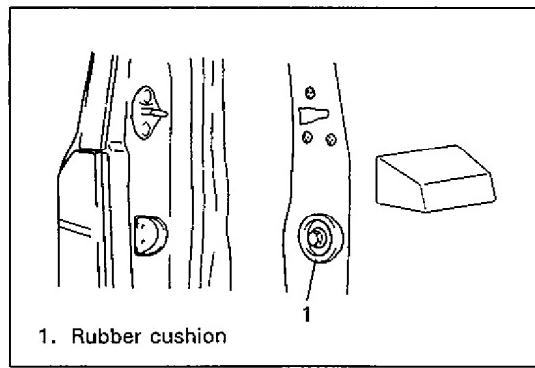
60A50-9-18-1S



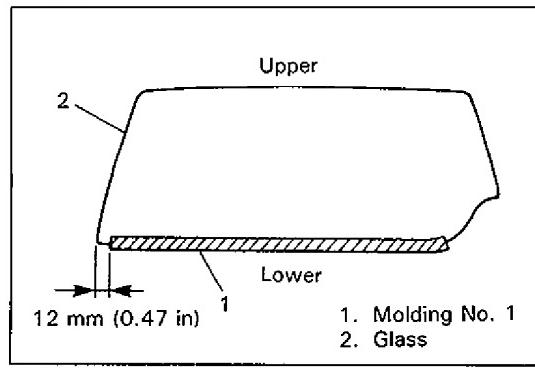
60A50-9-18-2S



60A50-9-18-3S



60A50-9-18-4S



INSTALLATION

Reverse removal procedure to install back door.
Secure wiring harness.

NOTE:

Use adhesive to sealing cover to back door.

Adjust the followings:

1. Door latch striker.

Adjust the door latch striker so that its center aligns with the center of groove in door latch base.
To adjust door latch and stricker with each other, insert proper number of shims below the bottom of stricker, as shown.

2. Door rubber cushion.

Move rubber cushion installed at the left side of back door to align it with its guide.

DOOR GLASS

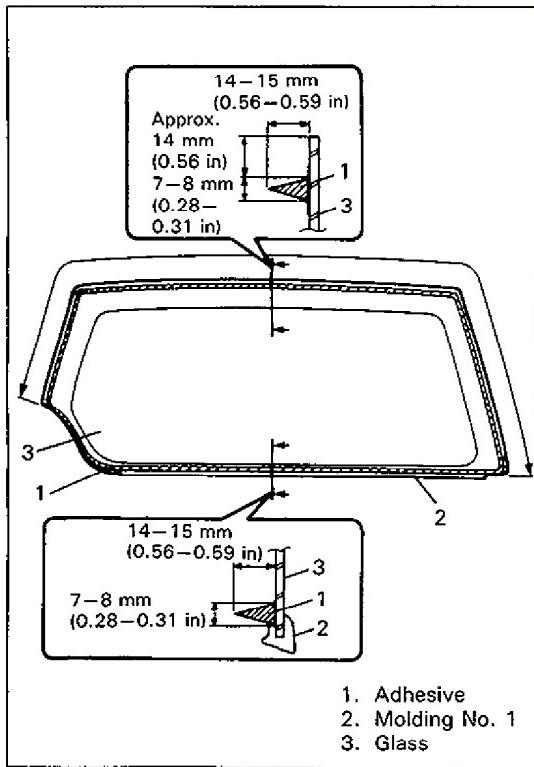
REMOVAL AND INSTALLATION

Refer to "FRONT WINDSHIELD" section as removal and installation procedures are the same.

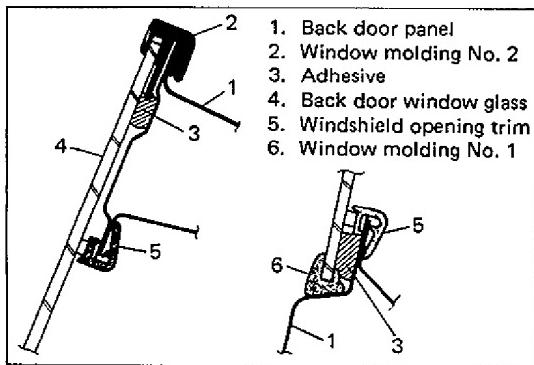
NOTE:

- Before applying primer to glass edge, install molding No. 1 according to installing position shown in figure.

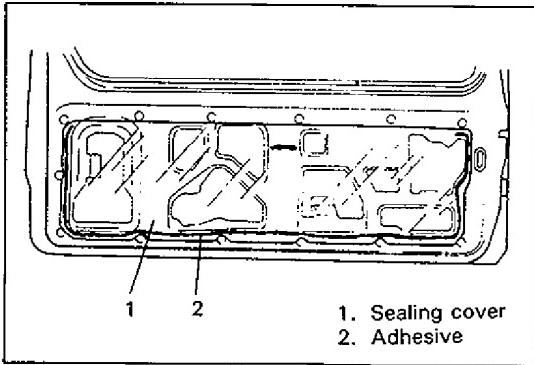
60A50-9-18-5S



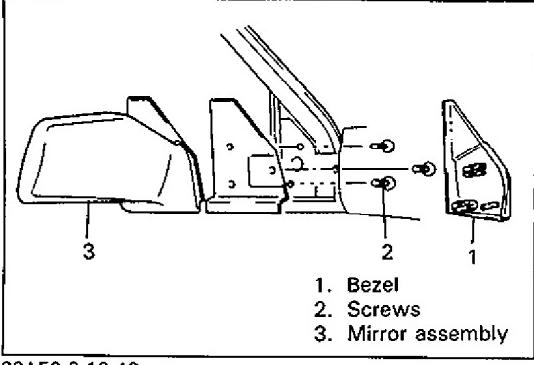
60A50-9-19-1S



60A50-9-19-2S



60A50-9-19-3S



60A50-9-19-4S

- Observe following precautions when applying adhesive along glass edge.
 - Adhesive should be applied evenly especially in height.
 - Be careful not to damage primer.
 - Press glass against body quickly after adhesive is applied.

- When replacing back door, coat replacement door inside with wax for proper anticorrosive treatment. Refer to "ANTI-CORROSION TREATMENT" in this section.

- Apply sealing compound to peripheral of door hem area and reinstall door sealing cover.
- When weatherstrip is hardened and water leaks have developed, replace it.

OUTSIDE REAR VIEW MIRROR

REMOVAL

Remove following parts.

1. Pull out bezel.
2. Mirror attaching screws.
3. Mirror assembly.

INSTALLATION

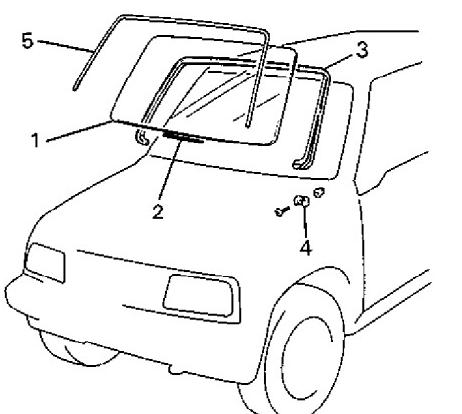
Reverse removal procedure to install.

WINDSHIELD

The front windshield is installed by using a special type of adhesive (that is, one component urethane adhesive used with primer). For the windshield replacement, it is important to use an adhesive which provides sufficient adhesion strength and to follow the proper procedure.

CAUTION:

Described here is the glass replacement by using one component urethane adhesive which is used with primer in combination. Each adhesive has its own drying and setting time and must be handled and used according to specific procedure. Negligence in following such procedure or misuse of adhesive in any way hinders its inherent adhesive property. Therefore, before work, make sure to read carefully instruction and description given by the maker of adhesive to be used and be sure to follow the procedure and observe each precaution throughout the work.



1. Windshield glass
2. Windshield glass spacer
3. Windshield opening trim
4. Windshield glass topper
5. Windshield molding

60A50-9-20-1S

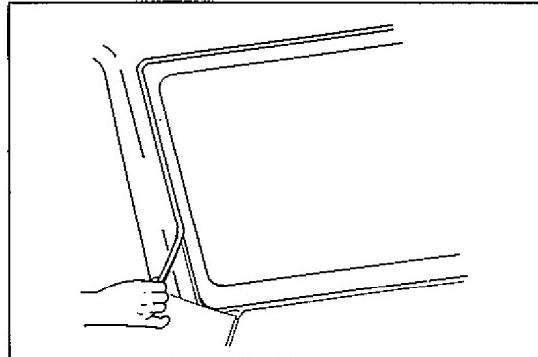
Use an adhesive of above mentioned type which has following property.

Shearing strength: 40kg/cm² or more (569 lb/in²)

Adhesive materials and tools required for removal and installation.

- One component urethane adhesive and primer used in combination (For one sheet of windshield glass).
 - Adhesive (550 g (19.5 oz.))
 - Primer for glass (30 g (1.0 oz.))
 - Primer for body (30 g (1.0 oz.))
- Eyeleteer
- Piano string
- Brush for primer application (2 pcs)
- Knife
- Rubber sucker grip
- Sealant gun (for filling adhesive)
- Putty spatula (for correcting adhered parts)

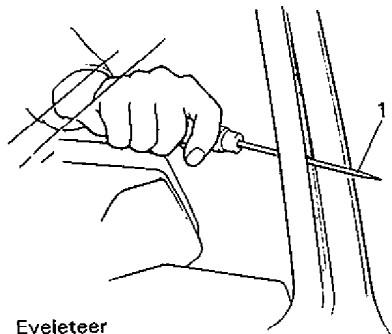
60A50-9-20-4S



60A50-9-20-5S

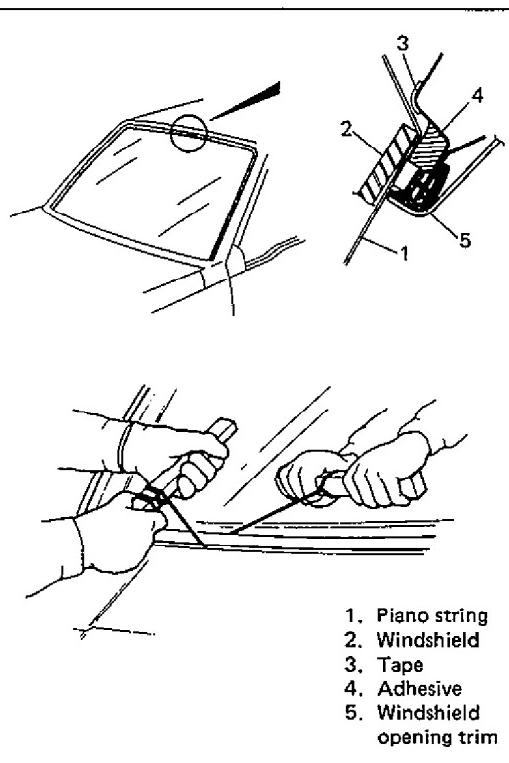
REMOLVAL

- 1) Clean both inside and outside of glass and around it.
- 2) Remove wiper arms and garnish.
- 3) Remove moulding (outside).
- 4) Using tape, cover body surface around front windshield to prevent any damage.
- 5) Remove room mirror and inside trims.



60A50-9-21-1S

- 6) Drill hole with eyeleteer through adhesive and let piano string through it.

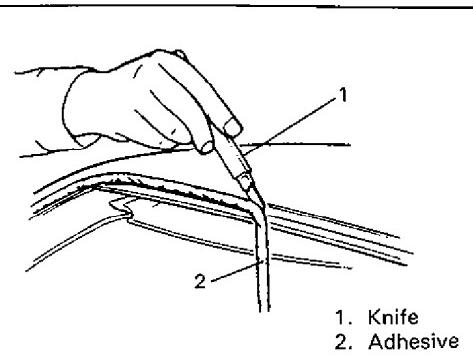


60A50-9-21-2S

- 7) Cut adhesive all around windshield with piano string.

NOTE:

Use piano string as close to glass as possible so as to prevent damage to body.

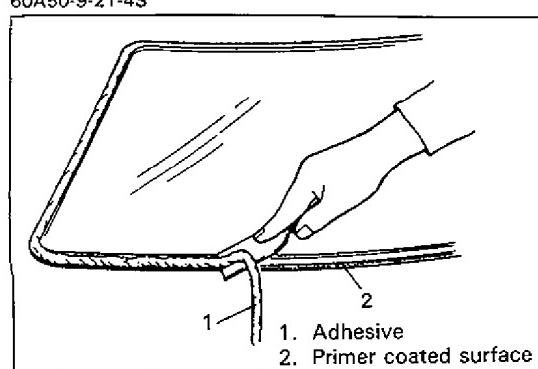


60A50-9-21-4S

- 8) Using knife, smoothen adhesive remaining on body side so that it is 1 to 2 mm thick all around.

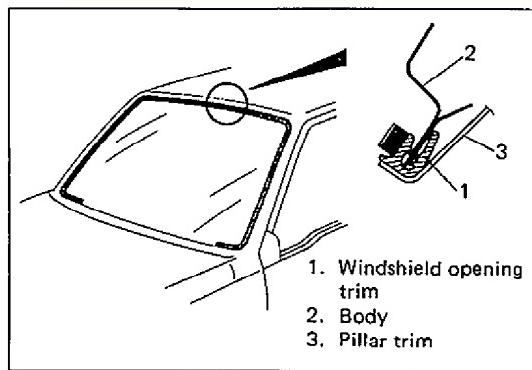
NOTE:

Before using knife, clean it with alcohol or the like to remove oil from it.

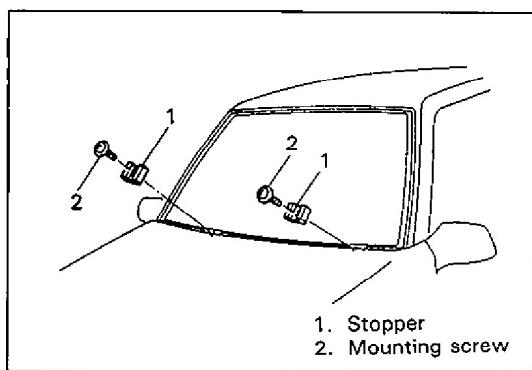


60A50-9-21-5S

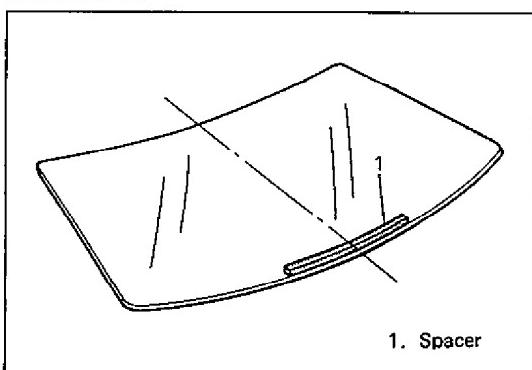
- 9) When re-using windshied, remove the adhesive from it, using care not to damage primer coated surface.



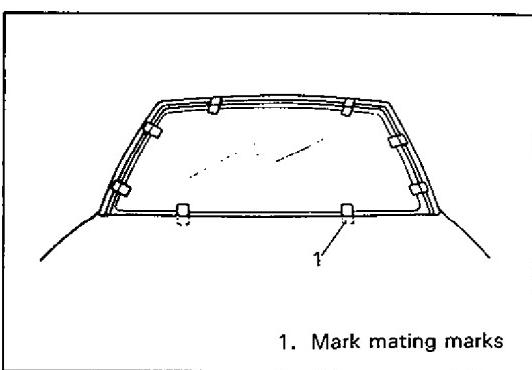
60A50-9-22-1S



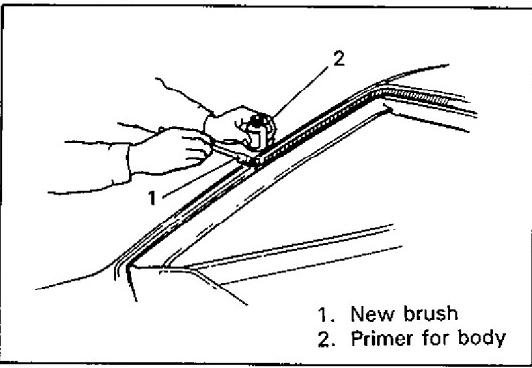
60A50-9-22-2S



60A50-9-22-3S



60A50-9-22-4S



60A50-9-22-5S

INSTALLATION

- 1) Usinig cleaning solvent, clean windshield edge where windshield glass is to be adhered. (Lef it dry for more than 10 minutes.)
- 2) Install front windshield opening trim.

- 3) Install glass stoppers (2 pcs) to lower side of front windshield.

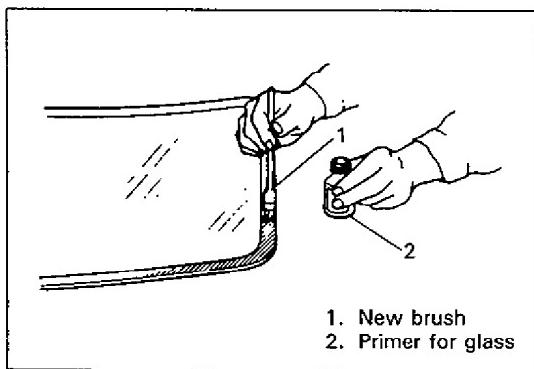
- 4) Peel paper from one side of new windshield adhesive tape and attach that lower side to windshield.

- 5) To determine installing position of glass to body, position glass against body so that clearance between lower end of glass and body is about 6 mm (0.236 in.) and clearances between each side end (right & left) of glass and body are even. Then mark mating marks on glass and body as shown.

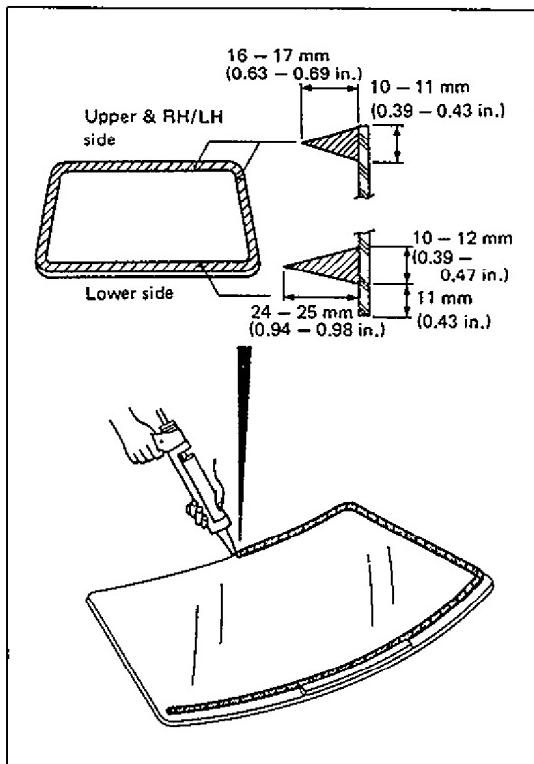
- 6) Using new brush, apply sufficient amount of primer for body along body surface where windshield glass is to be adhered.

NOTE:

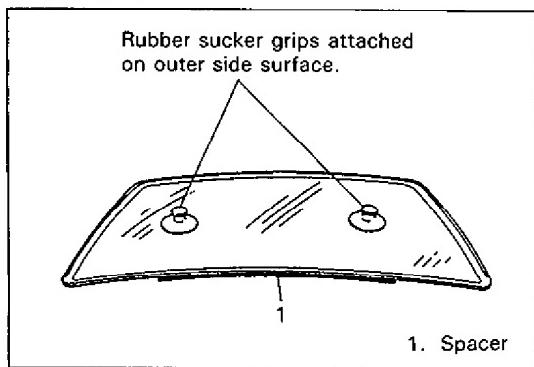
Be sure to refer to primer marker's instruction for proper handling and drying time.



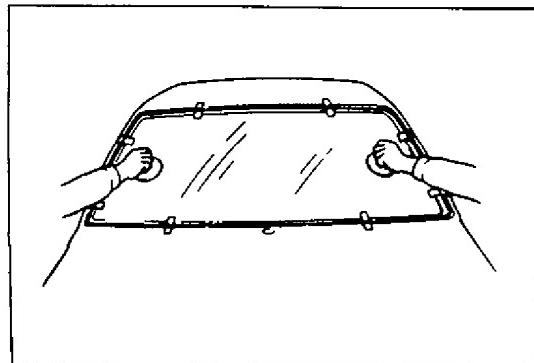
60A50-9-23-1S



60A50-9-23-2S



60A50-9-23-3S



60A50-9-23-4S

7) Clean glass surface to be adhered to body with a piece of clean cloth. If cleaning solvent is used, let it dry for more than 10 minutes.

8) Using new brush, apply sufficient amount of primer for glass along glass surface to be adhered to windshield.

NOTE:

- Be sure to refer to primer marker's instruction for proper handling and drying time.
- Do not touch primer coated surface.

9) Apply adhesive along glass edge.

NOTE:

- Start from bottom side of glass.
- Adhesive should be applied evenly especially in height.
- Be careful not to damage primer.
- Press glass against body quickly after adhesive is applied.

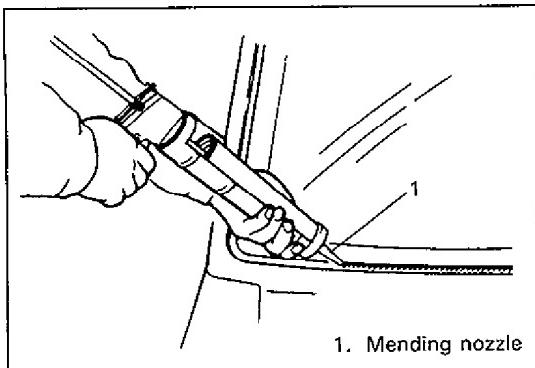
10) Stick spacer on glass as shown.

NOTE:

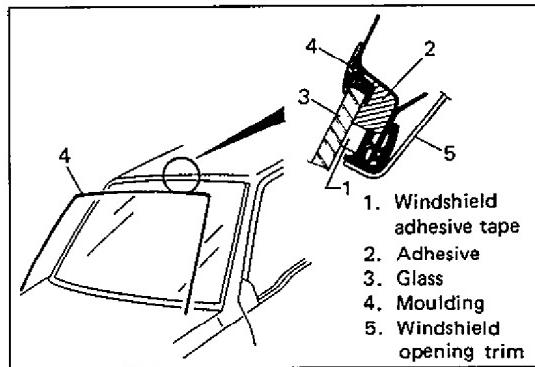
- Use of rubber sucker grips is helpful to hold and carry glass after adhesive is applied.

11) Peel remaining paper from trim.

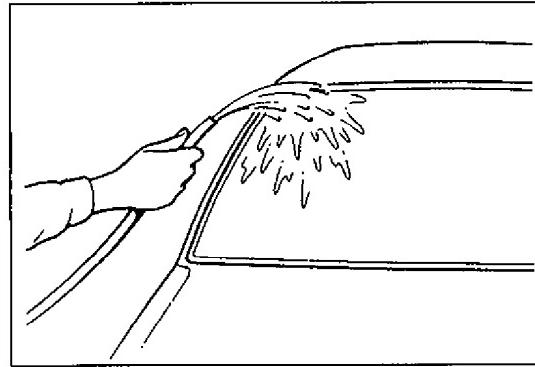
12) Holding rubber sucker grips, place glass onto body by aligning mating marks marked in step 5) and press it.



60A50-9-24-1S



60A50-9-24-2S



60A50-9-24-3S

- 13) Replace cartridge nozzle with mending nozzle and fill adhesive into underfilled part. Where adhesive is overfilled, remove excess. Also, wipe off adhesive on body and glass, if any, with cleaning solvent.

- 14) Fit new moulding. Warming moulding for over half an hour at 35°C (95°F) temperature will facilitate work.

- 15) Check for water leakage by pouring water over windshield through hose. If leakage is found, dry windshield and fill leaky point with adhesive. If water still leaks even after that, remove glass and start installation procedure all over again.

NOTE:

- Do not use high pressure water.
- Do not blow compressed air directly at adhesive applied part when drying.
- Do not use infrared lamp or like for drying.

CAUTION:

Upon completion of installation, note the following.

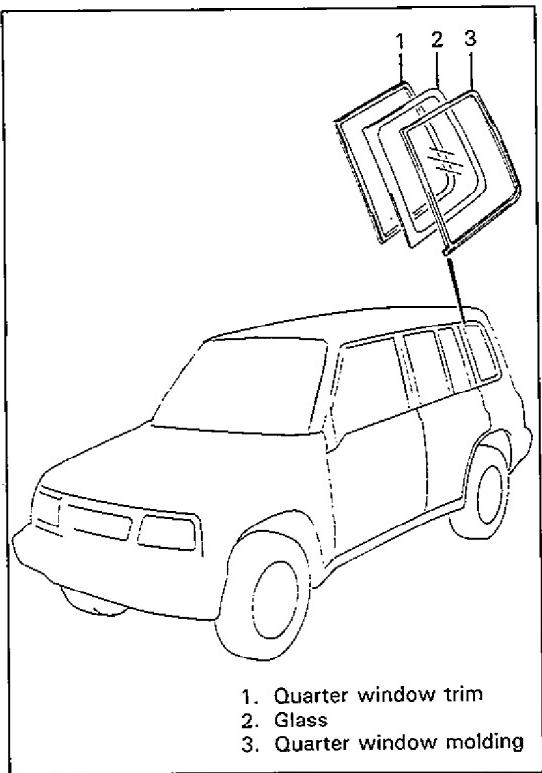
- Sudden closing of door before adhesive is completely set may cause glass to be come loose or to come off. Therefore, if door is opened or closed before adhesive is completely set, make sure to open all door glasses and use proper care.
- If moulding is not securely in place, hold it down with a tape until adhesive is completely set.
- Each adhesive has its own setting time. Be sure to refer to its maker's instruction, check setting time of adhesive to be used and observe precautions to be taken before adhesive is set.
- Refrain from driving till adhesive completely set so as to ensure proper and sufficient adhesion.

REAR QUARTER WINDOW

The rear quarter window is installed by using a special type of adhesive (that is, one component urethane adhesive used with primer). For window glass replacement, it is important to use an adhesive which provides sufficient adhesion strength and to follow the proper procedure.

CAUTION:

Described here is the glass replacement by using one component urethane adhesive to be used with primer in combination. Each adhesive has its own drying and setting time and must be handled and used in a certain specific procedure. Negligence in following such procedure or misuse of the adhesive in any way hinders its inherent adhesive property. Therefore, before the work, make sure to read carefully the instruction and description given by the maker of the adhesive to be used and be sure to follow the procedure and observe each precaution throughout the work.



60A50-9-25-1S

Use an adhesive of above mentioned type which has following property.

Separating strength (Peeling)

15—20 kg/10 mm (width) or more (83.8—112 lb/in (width))

Shearing strength

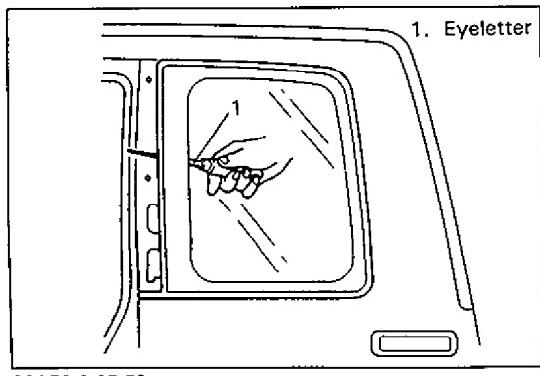
30 kg/cm² or more (427 lb/in²)

Adhesive materials and tools required for removal and installation.

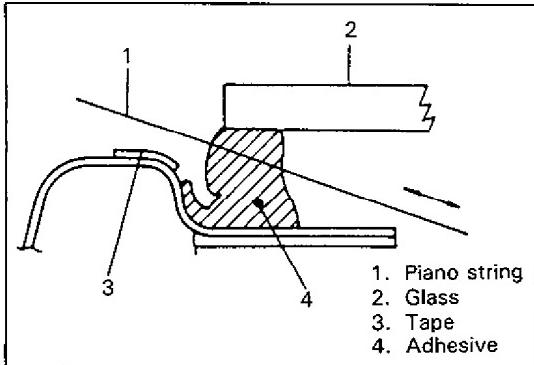
- One component urethane adhesive and primers used in combination (For one sheet of window glass).
 - Adhesive (370 g (13.1 oz.))
 - Primer for glass (30 g (1.1 oz.))
 - Primer for body (30 g (1.1 oz.))
- Eyeleteer
- Piano string
- Brush for primer application (2 pcs)
- Knife
- Rubber sucker grip
- Sealant gun (for filling adhesive)
- Putty spatula (for correcting adhered parts)

REMOVAL

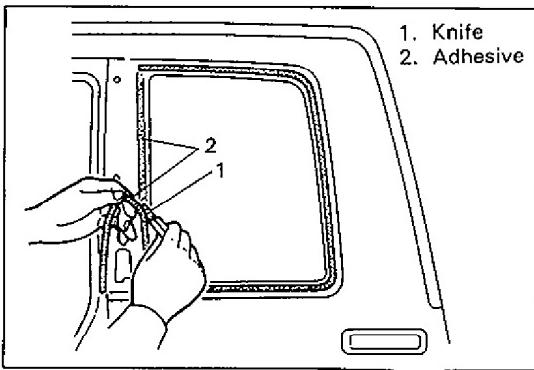
- 1) Remove rear quarter window trim.
- 2) Cut moulding all around quarter glass with knife.
- 3) Using a tape, cover body surface around quarter window glass to prevent any damage.
- 4) Remove quarter window trim.
- 5) Drill a hole with an eyeleteer through adhesive and let a piano string through it.



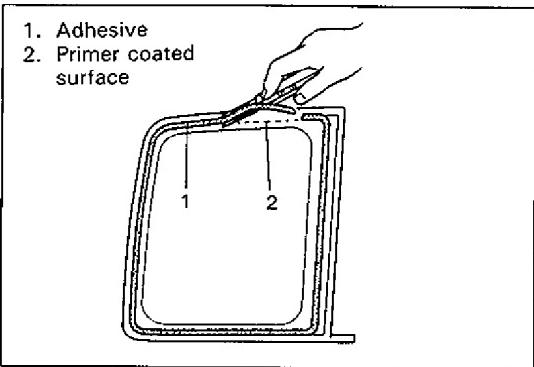
60A50-9-25-5S



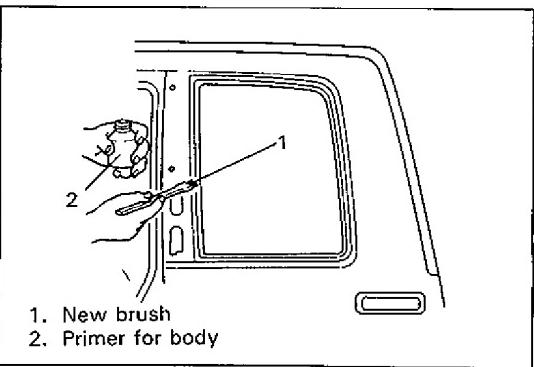
60A50-9-26-1S



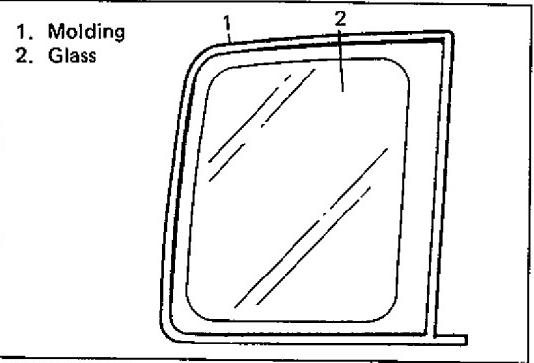
60A50-9-26-2S



60A50-9-26-3S



60A50-9-26-4S



6) Cut adhesive all around quarter glass with piano string.

CAUTION:

Use piano string as close to glass as possible so as to prevent damage to body.

7) Using a knife, smooth adhesive remaining on body side so that it is 2–3 mm thick all around.

8) Where adhesive rubber dam will be attached, remove adhesive until painted surface is exposed and clean.

9) When re-using glass, remove adhesive from glass, using care not to damage primer coated surface.

INSTALLATION

1) Using cleaning solvent, clean window opening edge where window glass is to be adhered. (Let it dry for more than 10 minutes.)

2) Using a new brush, apply sufficient amount of primer for body along body surface where window is to be adhered.

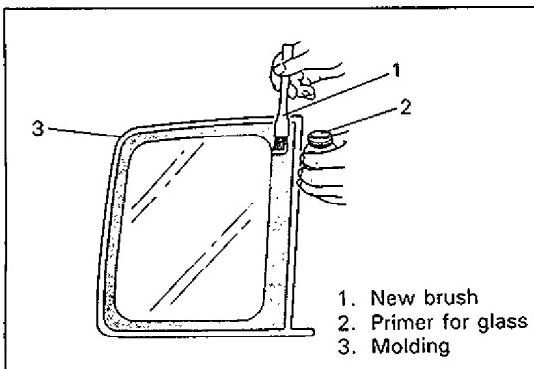
NOTE:

Be sure to refer to marker's instruction for proper handling and drying time.

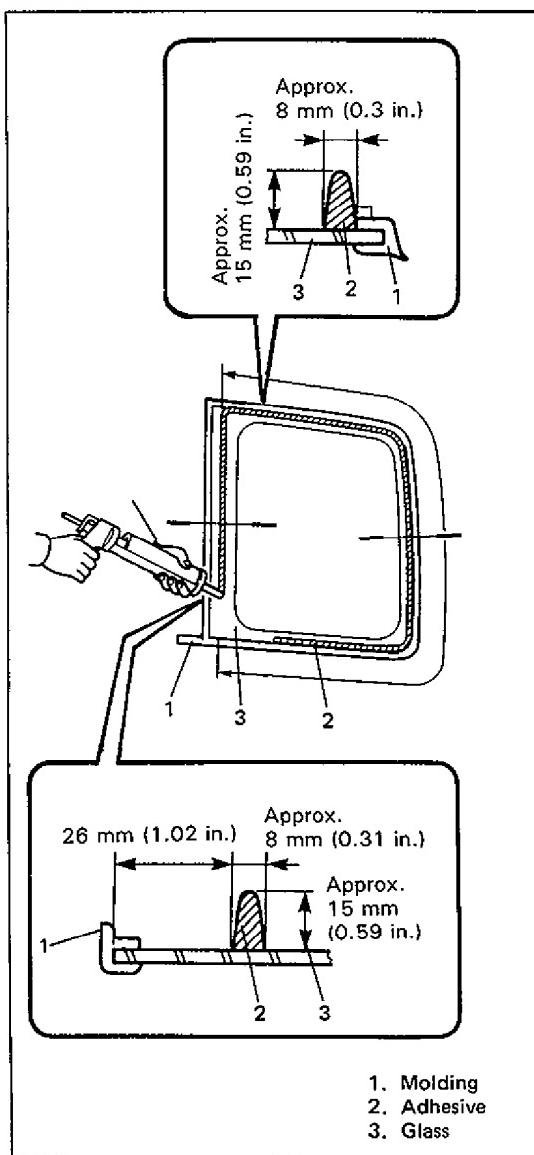
3) Clean glass surface to be adhered to window with clean cloth. If unleaded gasoline is used, let it dry for more than 10 minutes.

4) Slide glass into new moulding.

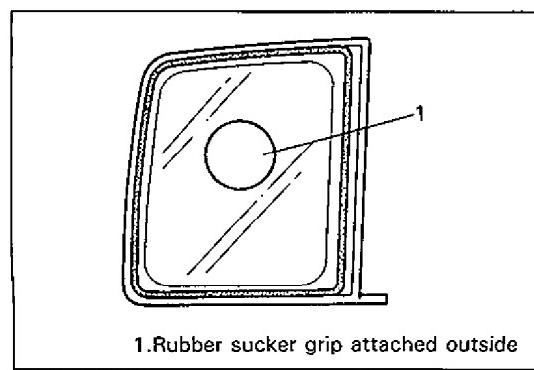
60A50-9-26-5S



60A50-9-27-1S



60A60-9-27-2S



60A50-9-27-5S

- 5) Using a new brush, apply sufficient amount of primer for glass along glass surface to be adhered to window.

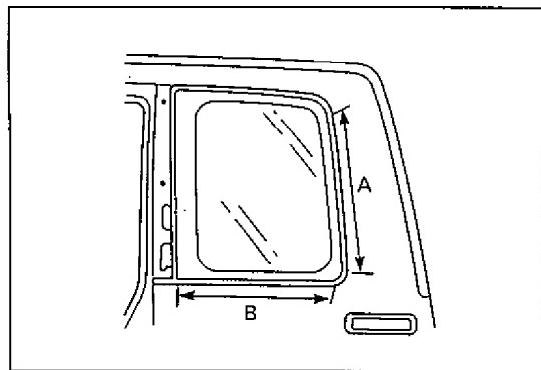
NOTE:

- Be sure to refer to maker's instruction for proper handling and drying time
- Do not touch primer coated surface.

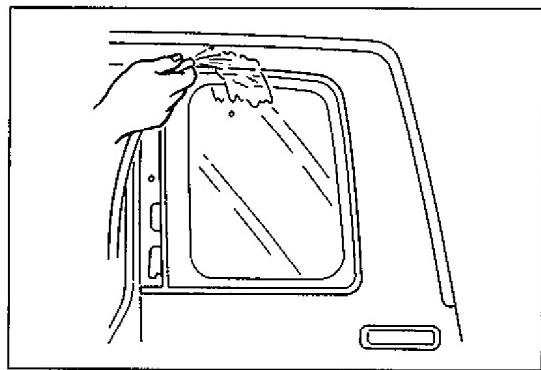
- 6) Apply adhesive as shown.

- 7) Peel remaining paper from rubber dam and molding.

- 8) Use of a rubber sucker grip is helpful to hold and carry glass after adhesive is applied.



60A50-9-28-1S



60A50-9-28-2S

- 9) As shown, eliminate glass-to-body clearance at A and B and attach glass with pressure applied to it.
- 10) Check for water leakage by pouring water over window through a hose. If a leakage is found, dry window and fill leaky point with adhesive. If water still leaks even after that, remove glass and start installation procedure all over again.
- NOTE:**
- Do not use high pressure water.
 - Do not blow compressed air directly at adhesive applied part when drying.
 - Do not use an infrared lamp or the like for drying.

CAUTION:

Upon completion of installation, note the following.

- Sudden closing of door before adhesive is completely set may cause glass to become loose or to come off. Therefore, if door is opened or closed before adhesive is completely set, make sure to open all door glasses and use proper care.
- Each adhesive has its own setting time. Be sure to refer to maker's instruction, check setting time of adhesive to be used and observe precautions to be taken before adhesive is set.
- Refrain from driving till adhesive is completely set so as to ensure proper and sufficient adhesion.

60A50-9-28-3S

SEAT

NOTE:

Seat varies depending on the specifications.

FRONT SEAT

REMOVAL

1. Remove four mounting bolt fixing front seat to seat rail to remove front seat.
2. Disassemble and repair seat as necessary.

INSTALLATION

Reverse removal procedure to install front seat.
Torque to specifications, as shown.

Seat mounting bolt (8 mm ④)

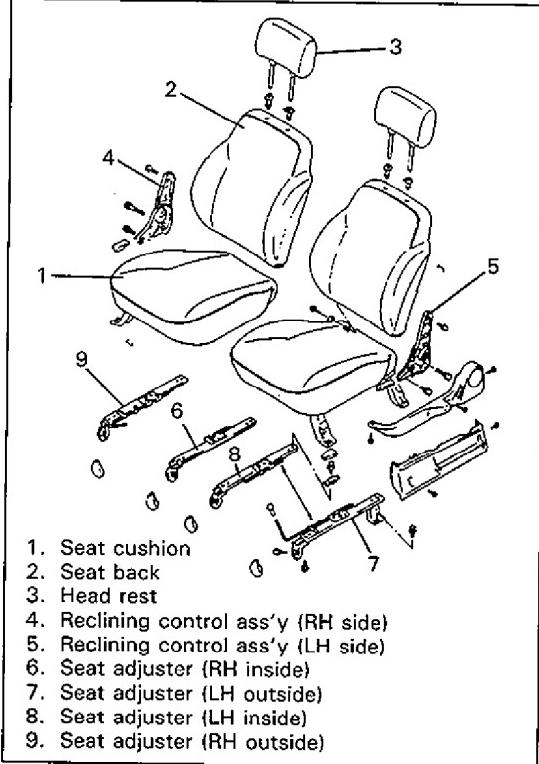
10–16 N·m (1.0–1.6 kg-m, 7.0–11.5 lb-ft)

Reclining device tightening bolt (8 mm ⑦)

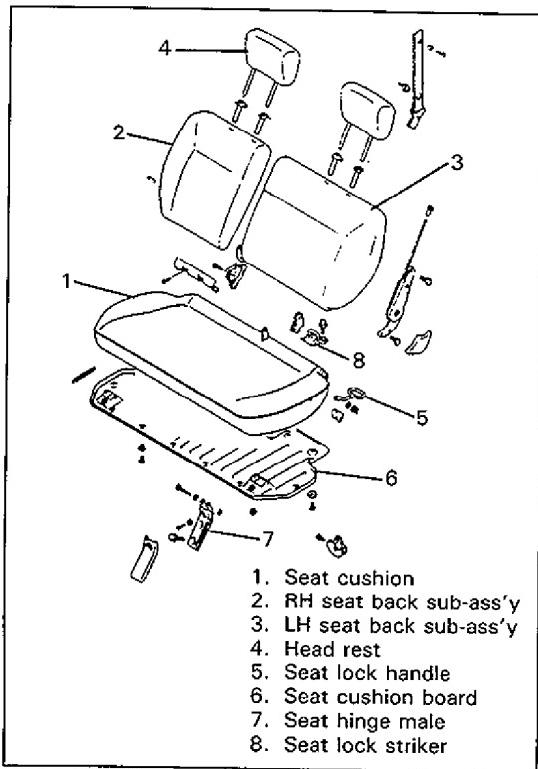
18–28 N·m (1.8–2.8 kg-m, 13.0–20.0 lb-ft)

Reclining device tightening bolt (10 mm ⑦)

40–60 N·m (4.0–6.0 kg-m, 29.0–43.5 lb-ft)



60A50-9-29-1S



60A50-9-29-3S

REAR SEAT

REMOVAL

1. Unlock seat cushion lock.
2. Remove four mounting bolts.
3. Disassemble and repair seat as necessary.

INSTALLATION

Reverse removal procedure to install rear seat.

SEAT BELTS

NOTE:

Whether seat belt retractor or seat belt is installed or not depending on specifications.

DESCRIPTION

The Emergency Locking Retractor (ELR) operates as follows, if equipped. The ELR, a double-sensor type, senses (1) the speed of the webbing as it is drawn from retractor and (2) the acceleration, deceleration, and tilting of the vehicle to lock the seat belt.

SERVICING SEAT BELTS

Before servicing or replacing seat belts, refer to following precautionary items.

1. Seat belts should be normal relative to strap retractor and buckle portions.
2. Keep sharp edges and damaging objects away from belts..
3. Avoid bending or damaging any portion of belt buckle, latch plate, and ELR.
4. Do not bleach or dye belt webbing. (Use only mild soap and lukewarm water to clean it.)
5. When installing a seat belt anchor bolt, start bolt by hand to prevent cross-threading.
6. Do not attempt any repairs on retractor mechanisms or retractor covers. Replace defective assemblies with new replacement parts.
7. Keep belts dry and clean at all times.
8. If there exist any parts in question, replace them.
9. Replace belts with their webbing cut or otherwise damaged.
10. Do not put anything in trim panel opening which seat belt webbing passes through.

REMOVAL AND INSTALLATION

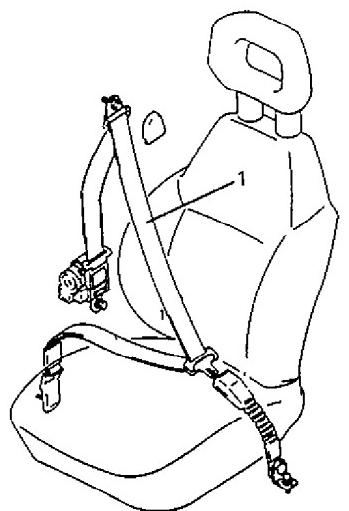
Refer to figures to remove and install front and rear seat belts.

NOTE:

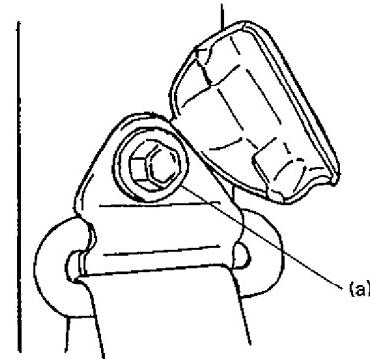
- Torque seat belt anchor bolts as specified.
- Seat belt anchor bolt should have an unified fine thread (7/16 – 20 UNF). Under no circumstances should any different sized or metric screw threads be used.

Tightening torque

(a): 40–50 N·m (4.0–5.0 kg·m, 29.0–36.5 lb·ft)



1. Front belt ass'y
2. Rear belt ass'y



INSPECTION

Seat belts and attaching parts can affect vital components and systems of vehicle.

Therefore, they should be inspected carefully and replaced with genuine parts only.

Inspect following parts.

1. Seat belt

Its webbing or strap should be free from damage.

2. Retractor

It sholuld lock webbing when pulled quickly. Front seat belt retractor should pass above inspection and should lock webbing even when tilted (approx. 15°) toward the fore and aft or right and left directions.

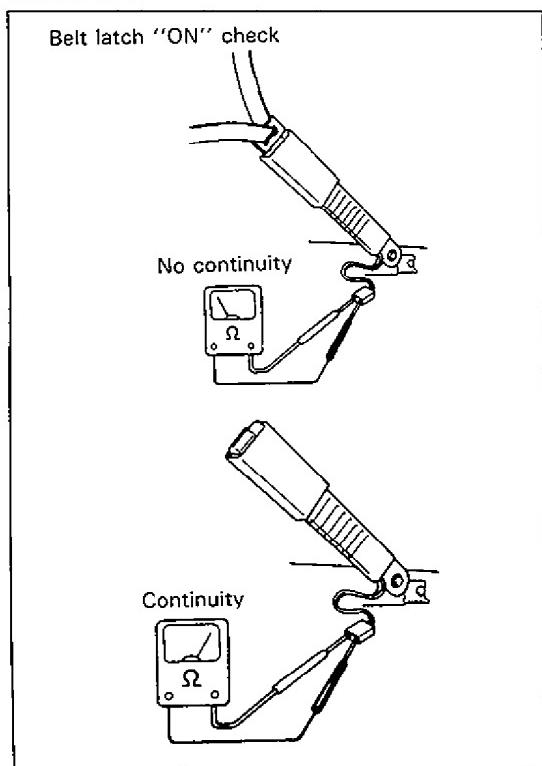
3. Anchor bolt

Anchor bolts should be torqued to specification.

4. Belt latch

It should be secure when latched.

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60A50-9-31-3S

5. Warning system (For Saudi Arabia market)

Check driver-side seat belt strap switch, as shown.

For details of seat belt warning system refer to "ELECTRICAL SYSTEM" section.

ANTI-CORROSION TREATMENT

WARNING:

Standard shop practices, particularly eye protection, should be followed during the performance of the below-itemized operations to avoid personal injury.

As rust proof treatment, steel sheets are given corrosion resistance on the interior and/or exterior. These corrosion resistance steel sheet materials are called one or two-side galvanized steel sheets.

It is for the sake of rust protection that these materials are selected and given a variety of treatments as described below.

1. Steel sheets are treated with cathodic electro-primer which is excellent in corrosion resistance.
2. Rust proof wax coatings are applied to door and side sill insides where moisture is liable to stay.
3. Vinyl coating is applied to body underside and wheel housing inside.
4. Sealer is applied to door hem, engine compartment steel sheet-to-steel sheet joint, and the like portions to prevent water penetration and resulting in rust occurrence.

In panel replacement or collision damage repair, leaving the relevant area untreated as it is in any operation which does disturb the above-mentioned rust proof treatment will cause corrosion to that area. Therefore, it is the essential function of any repair operation to correctly recoat the related surfaces of the relevant area. All the metal panels are coated with metal conditioners and primer coating during vehicle production. Following the repair and/or replacement parts installation, every accessible bare metal surface should be cleaned and coated with rust proof primer. Perform this operation prior to the application of sealer and rust proof wax coating.

Sealer is applied to the specific joints of a vehicle during production. The sealer is intended to prevent dust from entering the vehicle and serves also as an anticorrosive barrier. The sealer is applied to the door and hood hem areas and between panels. Correct and reseal the originally-sealed joints if damaged. Reseal the attaching joints of a new replacement panel and reseal the hem area of a replacement door or hood.

Use a quality sealer to seal the flanged joints, overlap joints and seams. The sealer must have flexible characteristics and paintability after it's applied to repair areas.

For the sealer to fill open joints, use caulking material. Select a sealer in conformance with the place and purpose of a specific use. Observe the manufacturer's label-stated instructions when using the sealer.

In many cases, repaired places require color painting. When this is required, follow the ordinary techniques specified for the finish preparation, color painting and undercoating build-up.

Rust proof wax, a penetrative compound, is applied to the metal-to-metal surfaces (door and side sill insides) where it is difficult to use ordinary undercoating material for coating. Therefore, when selecting the rest proof wax, it may be the penetrative type.

During the undercoating (vinyl coating) application, care should be taken that sealer is not applied to the engine-related parts and shock absorber mounting or rotating parts. Following the undercoating, make sure that body drain holes are kept open.

The sequence of the application steps of the anticorrosive materials are as follows:

1. Clean and prepare the metal surface.
2. Apply primer.
3. Apply sealer (all joints sealed originally).
4. Apply color in areas where color is required such as hem flanges, exposed joints and under body components.
5. Apply anticorrosive compound (penetrative wax).
6. Apply undercoating (rust proof material)

When the welding or heating operation causes the original galvanization or other anticorrosive materials to be burnt, the interior and under-body panel surfaces must be cleaned.

Removal of residues of the burning should be carried out carefully when the relevant place has box-type construction or has shape which limits the access to the interior surfaces. In general, the following method can be used satisfactorily for the removal of those residues.

60A50-9-33-1S

Scrape the accessible places. If a standard putty knife or scraper does not fit to the relevant place, consider to use a more flexible scraper to a place narrowly enclosed by sheet metals.

A jet of compressed air can remove most residues, and is effective to limited areas. However, this type of operation absolutely requires eye protection.

METAL REPLACEMENT PARTS FINISHING

The metal service replacement parts (or assemblies) are coated with electro-deposition primer. For the proper adhesion of a paint, the following finish process (refinish steps) becomes necessary.

1. Use wax or grease-removing solvent to clean the part.
2. Use a wet or dry sand-paper (No. 400) to polish the panel lightly. Do not polish it forcibly to produce any scratch. Clean the part again.
3. If factory-applied primer coating is cut through to the bare metal, apply metal conditioner to the bare metal exposed to open air. As for method of use of the metal conditioner, follow directions on the container.
4. Apply primer-surfacer to the part completely dry before starting sand-paper polishing. As for drying time, follow directions advised on the primer-surfacer container.
5. Use a wet or dry sand-paper (No. 400) and water to polish the panel lightly.
6. Wash the part again.
7. Apply color, coating to the part.
8. Different paints demand different drying methods. Hence, follow directions advised on the pertinent paint container.

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9. When lacquer coating (quick-drying paint coating) is applied, dry coated surface and polish it with compound.

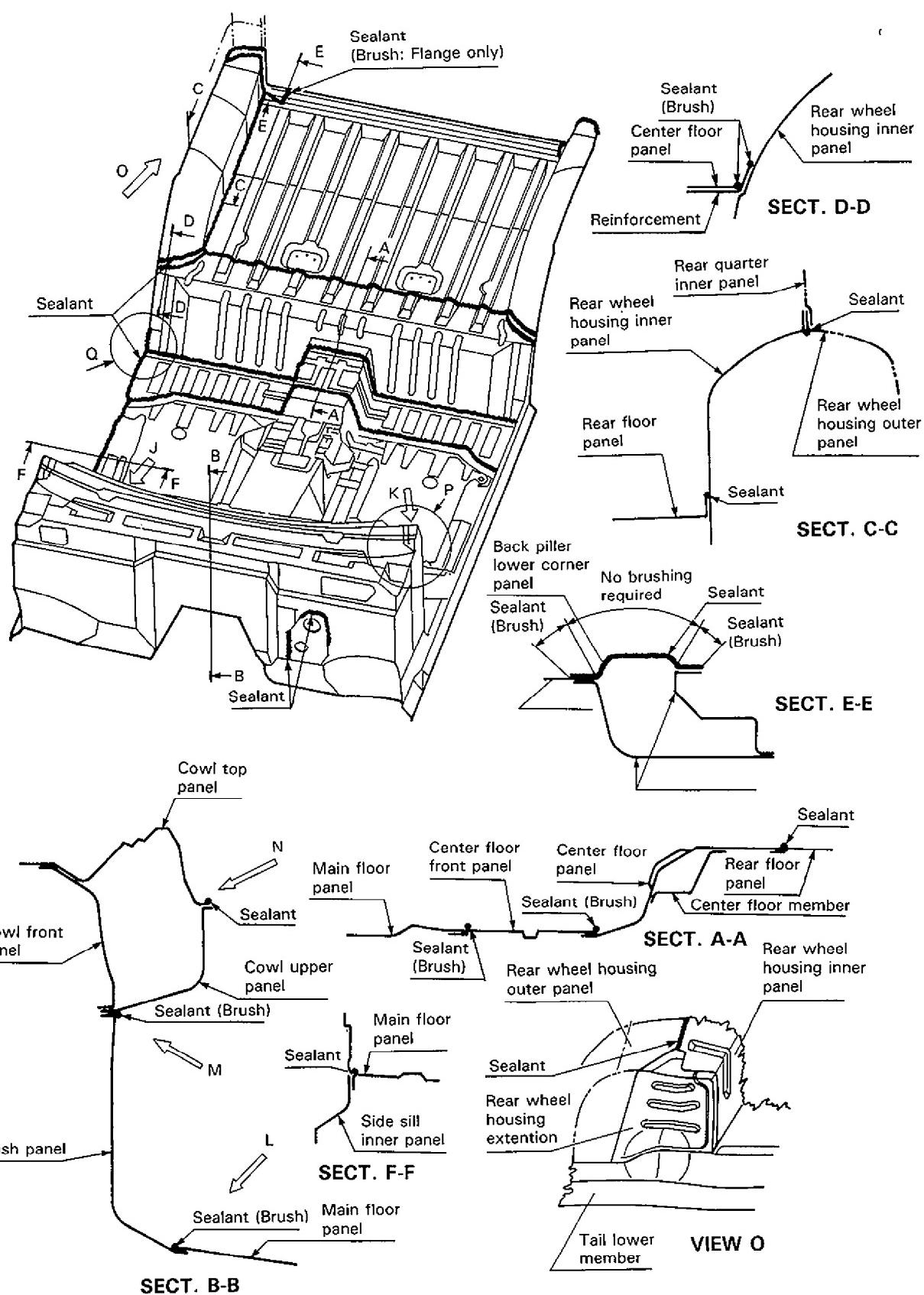
In the case of the melamine or acrylic coating, compound polishing can be omitted after drying.

10. In the case of lacquer coating, wax should not be applied to coated surface until the surface has dried completely (for approx. two months).

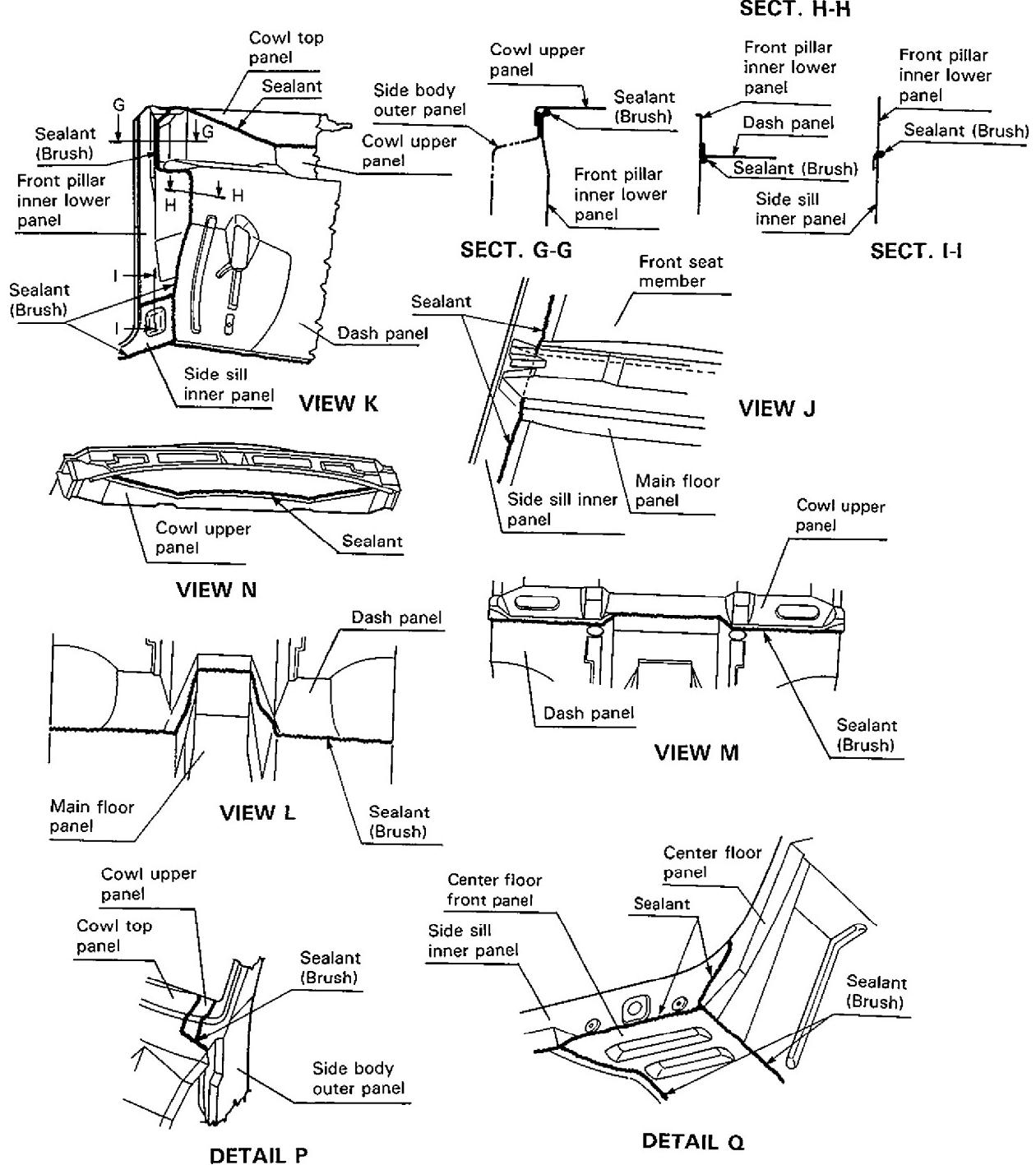
Before replacing exterior parts or assemblies, check paint conditions of all the covered or hidden interior surfaces. If any rust scale is found at these places, proceed as follows:

1. Use a proper wire brush, adhesive or liquid rust removing agent to remove rust. As for the method of use, follow directions advised for respective materials.
2. If necessary, wash parts with detergent, rinse, and dry them.
3. Before installing exterior body parts, apply anticorrosive compound to all cleaner surfaces of exterior body parts. Also, apply anticorrosive compound to inner surfaces of exterior body parts to be installed.

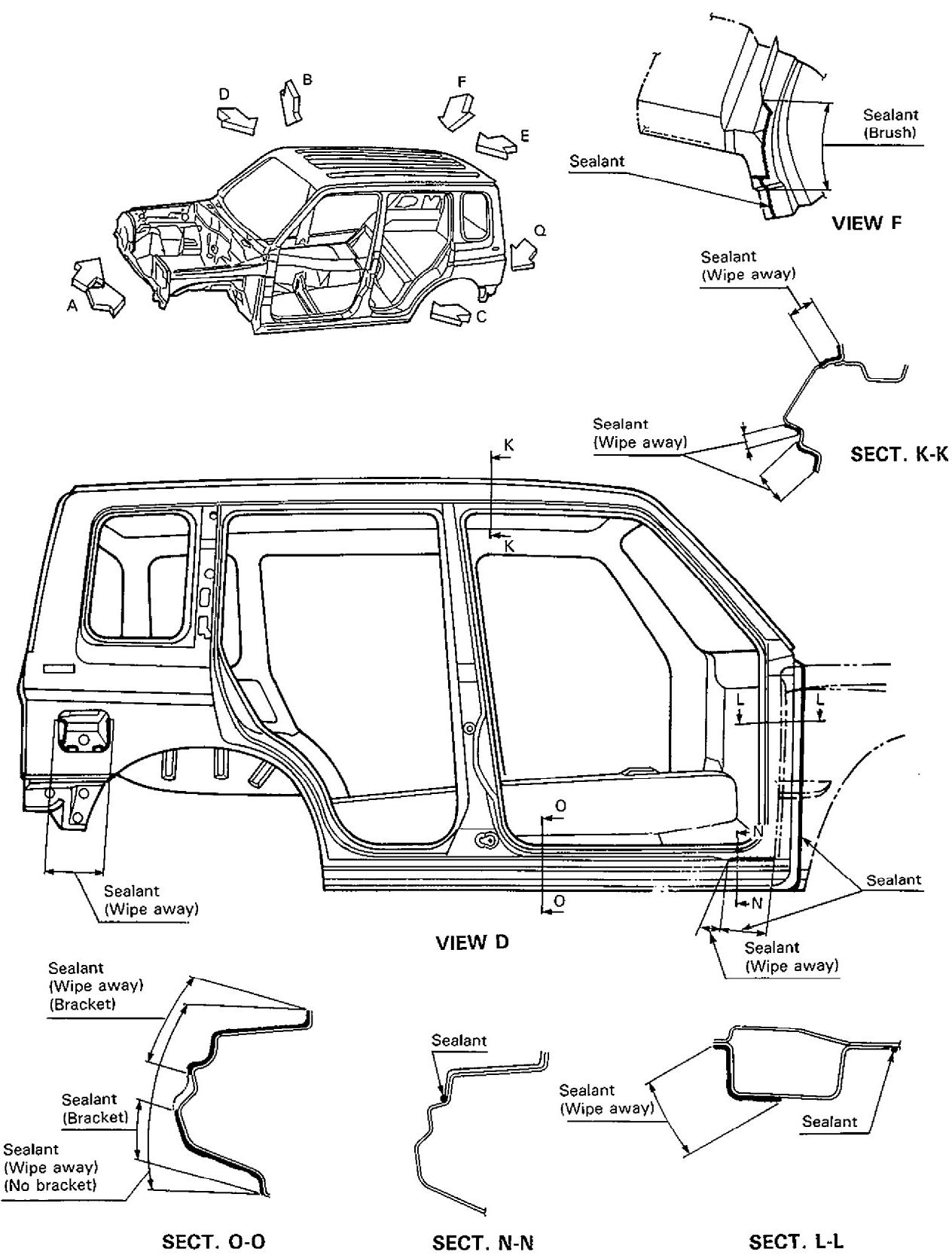
UNDER BODY SEALING No. 1



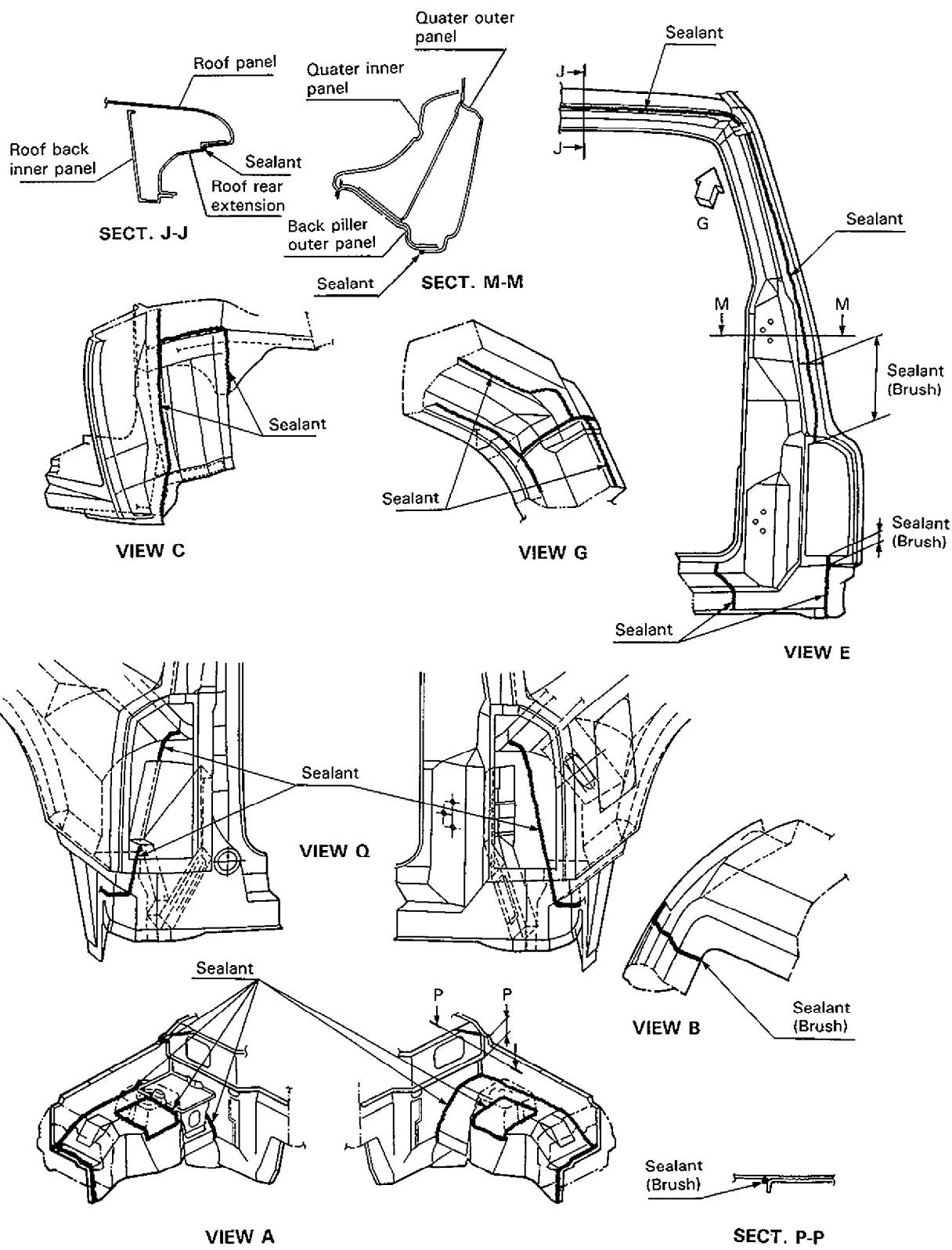
UNDER BODY SEALING No. 2



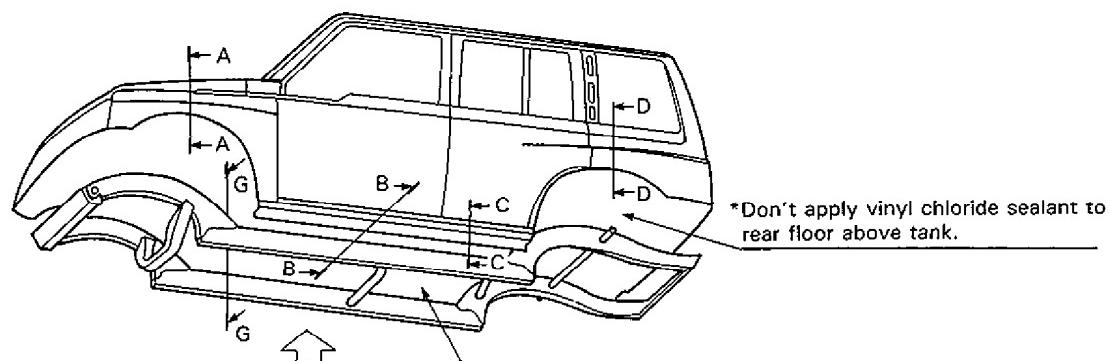
UNDER BODY SEALING No. 3



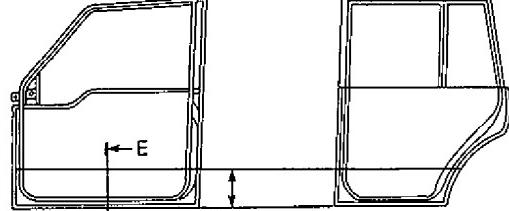
UNDER BODY SEALING No. 4



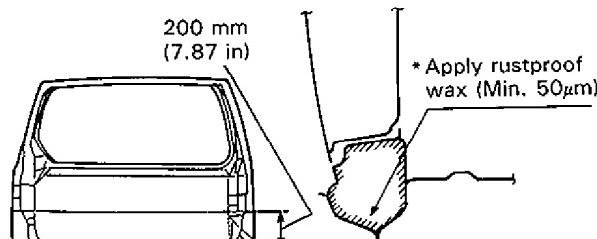
UNDER COATING/ANTI-CORROSION COMPOUND APPLICATION



*Apply rustproof wax to all over under floor (Min. 50 μm)



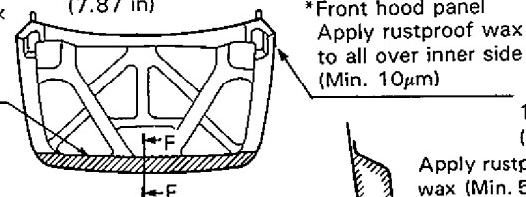
*Apply rustproof wax to blind part of hatching (Min. 50 μm)



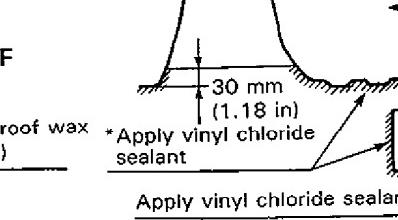
SECT. C-C

SECT. G-G

Apply vinyl chloride sealant (Min. 400 μm)

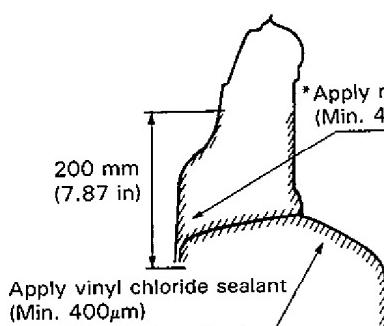


SECT. F-F



*Apply vinyl chloride sealant

*Apply vinyl chloride sealant



Apply vinyl chloride sealant (Min. 400 μm)

SECT. A-A

*Apply vinyl chloride sealant

*Apply vinyl chloride sealant

The parts with (*) is provided or not depending on specification.

PLASTIC PARTS FINISHING

Paintable plastic parts are ABS plastic parts. ABS plastic is used for the front grille and headlamp cover.

Painting

Rigid or hard ABS plastic needs no primer coating. General acrylic lacquers can be painted properly over the hard ABS plastic in terms of adherence.

1. Use cleaning solvent for paint finish to wash the part.
2. Apply conventional acrylic color lacquer to the part surface.
3. Follow lacquer directions for required drying time. (As for drying temperature, a range of 60 to 70°C is proper.)

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Reference

Plastic parts employ not only ABS (Acrylonitrile Butadiene Styrene) plastic but also polypropylene, vinyl, or the like plastic. Burning test method to identify the ABS plastic is described below.

1. Use a sharp blade to cut off a plastic sliver from the part at its hidden backside.
2. Hold sliver with pincers and set it on fire.
3. Carefully observe condition of the burning plastic.
4. ABS plastic must raise readily distinguishable black smoke while burning with its residue suspended in air temporarily.
5. Polypropylene must raise no readily distinguishable smoke while burning.

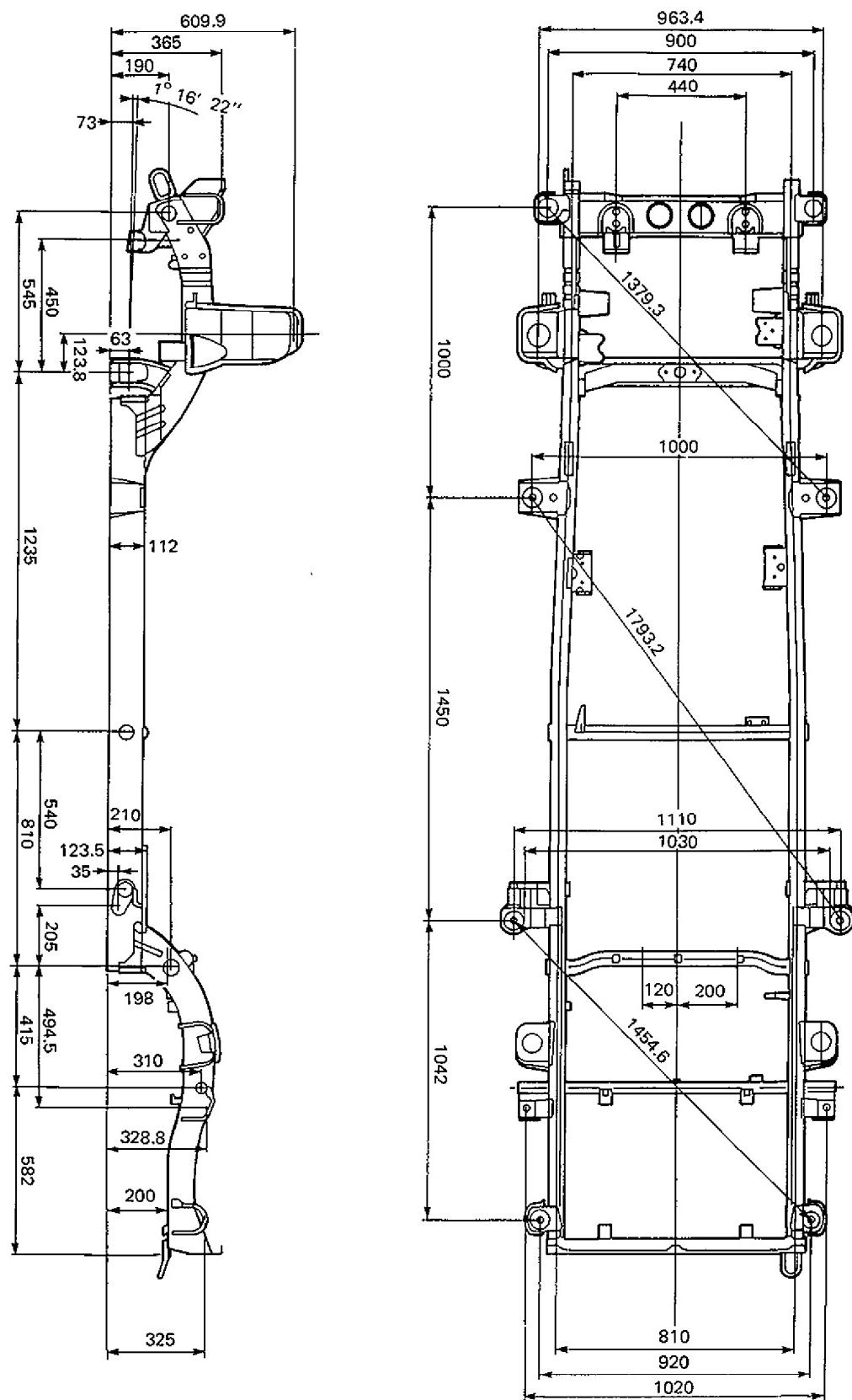
UNDERBODY

Each individual underbody component is not only affecting the strength of the entire unit of a vehicle but also relating to the wheel alignment (toe-in, camber, caster). It is essential, therefore, to properly check the underbody and correctly perform, if necessary, any welding operation connected to its correction or replacement.

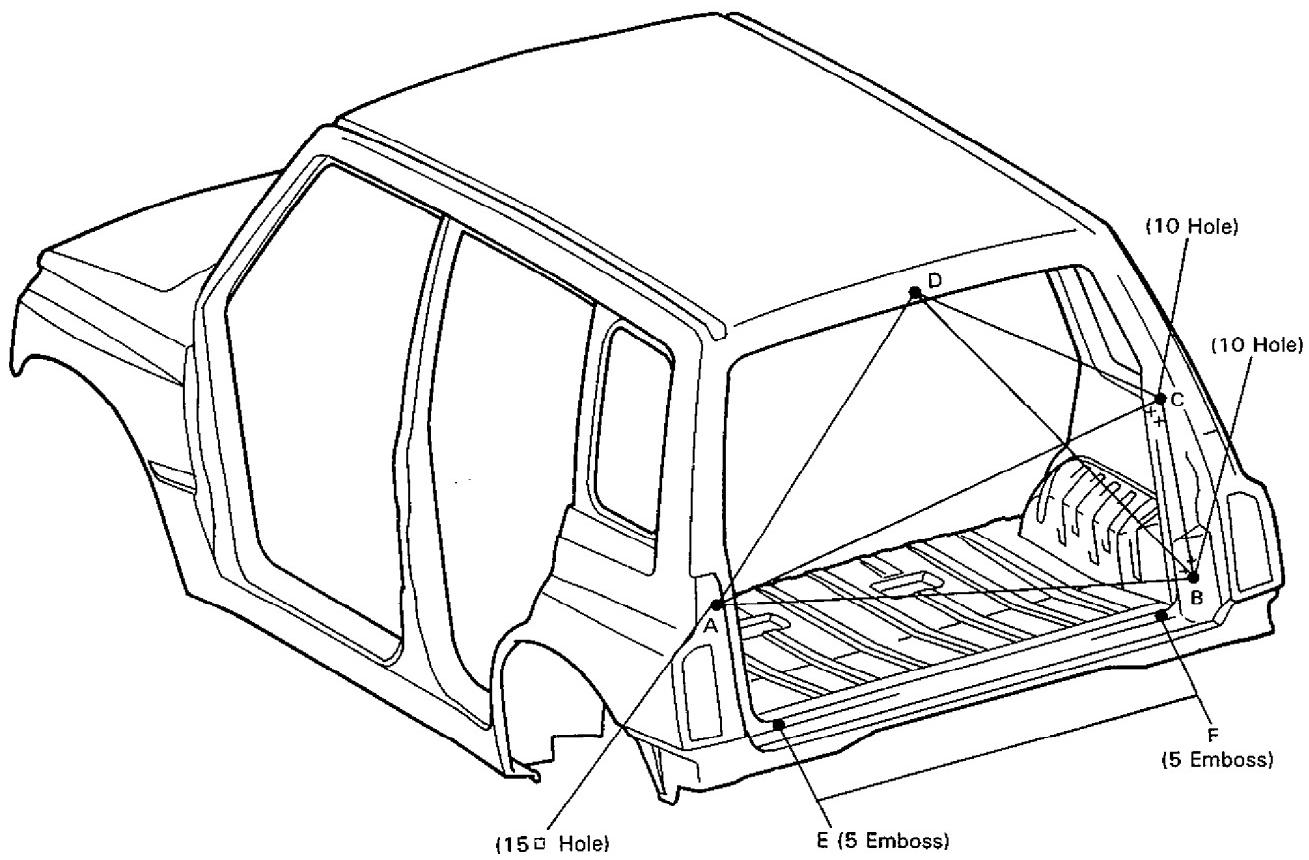
60A50-9-39-2S

When the underbody is found to have a damaged sealing or rust proof treatment, it is mandatory to apply correct sealing and rust proof treatment. As for the sealing and rust proof treatment, refer to the section "ANTI-CORROSION TREATMENT".

UNDERBODY DIMENSIONS

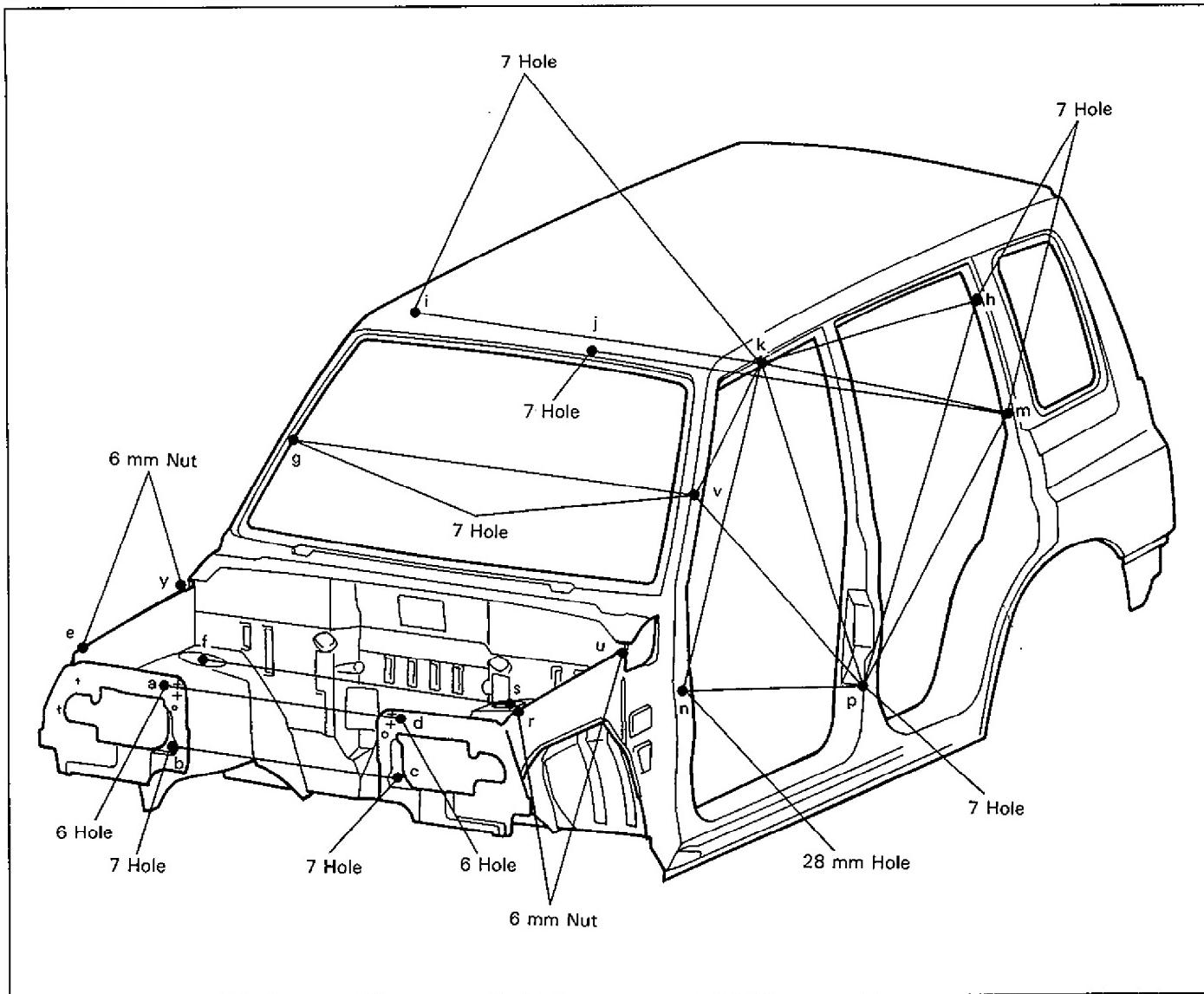


BODY DIMENSIONS



MEASUREMENT POSITION	LENGTH MM (in.)
A-B	1 256 (49.45)
B-C	429 (16.89)
C-D	702 (27.64)
D-A	876 (34.49)
D-B	1 013 (39.88)
A-C	1 238 (48.74)
E-F	1 003 (39.49)

BODY DIMENSIONS



MEASUREMENT POSITION	LENGTH MM (in.)	MEASUREMENT POSITION	LENGTH MM (in.)
a-b	174 (6.85)	k-i	1 070 (42.1)
a-d	730 (28.74)	k-h	1 124 (44.3)
a-c	738 (29.06)	k-m	1 205 (47.4)
b-d	738 (29.06)	k-p	1 027 (40.4)
b-c	730 (28.74)	m-j	1 301 (51.2)
d-c	174 (6.85)	m-p	989 (38.9)
y-e	526 (20.71)	v-g	1 242 (48.9)
e-u	1 450 (57.09)	v-k	564 (22.2)
e-r	1 351 (53.19)	v-p	1 098 (43.2)
y-u	1 351 (53.19)	n-k	1 041 (41.0)
f-s	952 (37.49)	p-h	1 183 (46.6)

IGNITION SWITCH LOCK CYLINDER

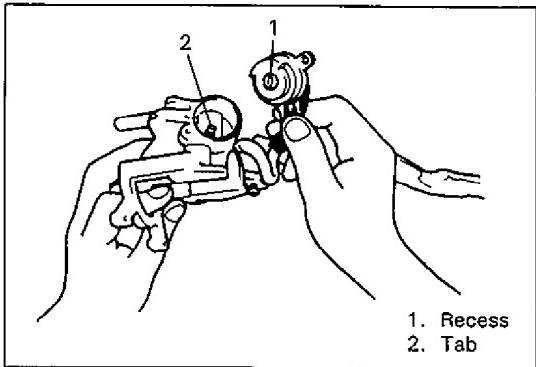
REMOVAL

Remove following parts.

- 1) Battery (—) terminal.
- 2) Steering wheel.
- 3) Turn signal/dimmer switch.
- 4) Steering column.
- 5) Steering lock (ignition switch lock cylinder).

Refer to steering section for removal and special tool.

60A50-9-43-1S



60A50-9-43-2S

INSTALLATION

Reverse removal procedure to install the main switch. Upon installation, position the main switch so that its recess is mated with tab on the bracket, as shown.

GLASS POLISHING

REMOVAL OF MINOR SCRATCHES AND ABRASIONS

Minor glass scratches and abrasions on outside surface of the glass can be removed or reduced by using methods described in this section.

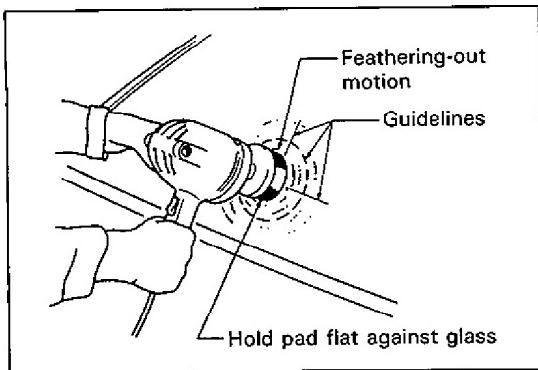
There are two basic types of auto glass; laminated safety plate (used in all windshields) and solid tempered safety plate (used in side and back windows).

A major concern in glass polishing is the chance of causing double vision in areas of occupant vision. For this reason, polishing of a windshield in the occupant's line of vision is more limited than in other areas. Distortion is most apt to result when trying to remove deep scratches. Glass polishing must be performed with care.

The items listed below are needed for glass polishing.

1. Low speed (600—1300 rpm) rotary polisher (Skil Model No. 570 or equivalent).
2. Wood felt rotary-type polishing pad, about 75 mm (3 in.) in diameter and 51 mm (2 in.) thick.
3. Powdered cerium oxide (No. 14 Rareox or equivalent) mixed with water as abrasive compound. Follow manufacturer's directions when using any type of polishing compound.
4. Wide mouth container to hold the polish.

60A50-9-43-3S



60A50-9-44-1S

GLASS POLISHING PROCEDURE

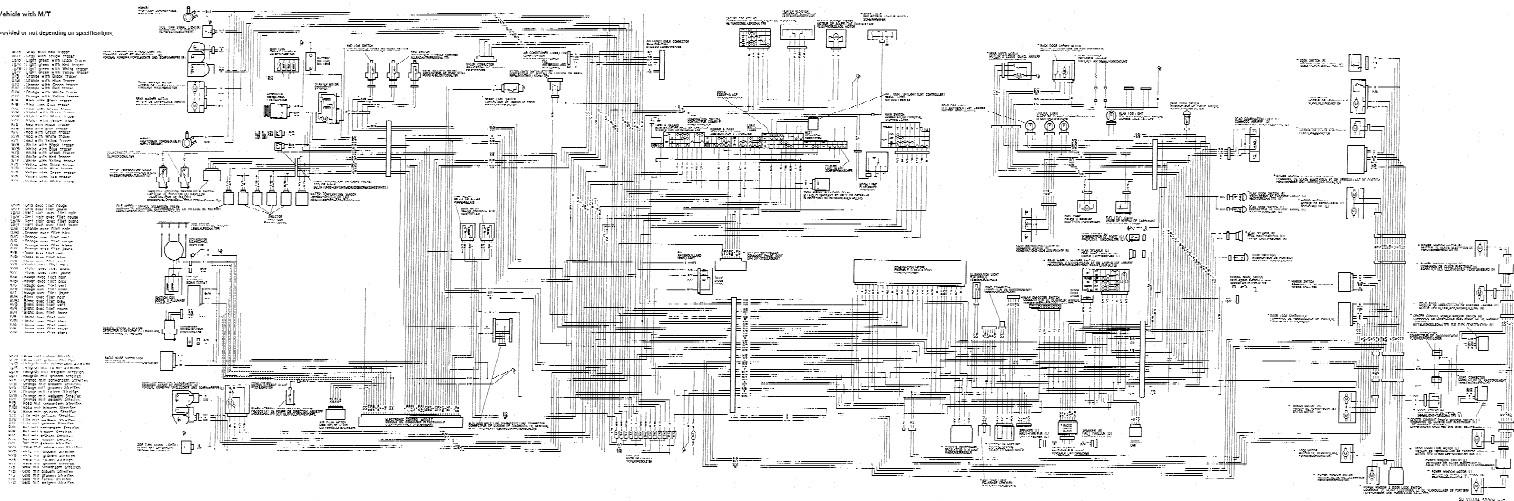
NOTE:

This operation must not be used on the inside of rear window glass which has heating elements in glass because heating elements will be damaged.

1. Mix two parts of polishing compound (No. 14 Rareox or equivalent) with one part water to obtain a creamy mixture.
2. Stir mixture now and then to maintain a creamy texture. Powdered cerium oxide is hard to mix with water and tends to separate.
3. Draw circle around scratches on opposite side of glass with a wax marking pencil or crayon. Draw other lines directly behind scratches to serve as guides in locating scratch during polishing.
4. Use masking paper where needed to catch drippings or spattered polish.
5. Dip felt pad attached to polisher into mixture several times to insure that pad is well saturated. Do not submerge or allow pad to stay in mixture as it may loosen bond between pad and metal plate.
6. Using moderate, but steady, pressure, hold pad flat against scratched area of glass, and with a feathering-out motion, polish affected area, as shown. Avoid heavy pressure. It does not speed up operation and may cause overheating of glass.
7. Cover enough area around scratch with a feathering-out motion, as shown, to eliminate any chance of a bull's-eye. Do not hold tool in one spot or operate tool on glass any longer than 30 to 45 seconds at a time.
If glass becomes hot to touch, let it air cool before proceeding further. Cooling with cold water may crack heated glass.
8. Dip pad into mixture about every fifteen seconds to insure that wheel and glass are always wet during polishing operation. A dry pad caused too much heat to build up.
9. After removing scratch or abrasion, wash glass with water and wipe body clean of any polish.
10. Clean polishing pad.
Care should be taken during polishing and storage to keep pad free of foreign material such as dirt, metal filings, etc.

WIRING DIAGRAM

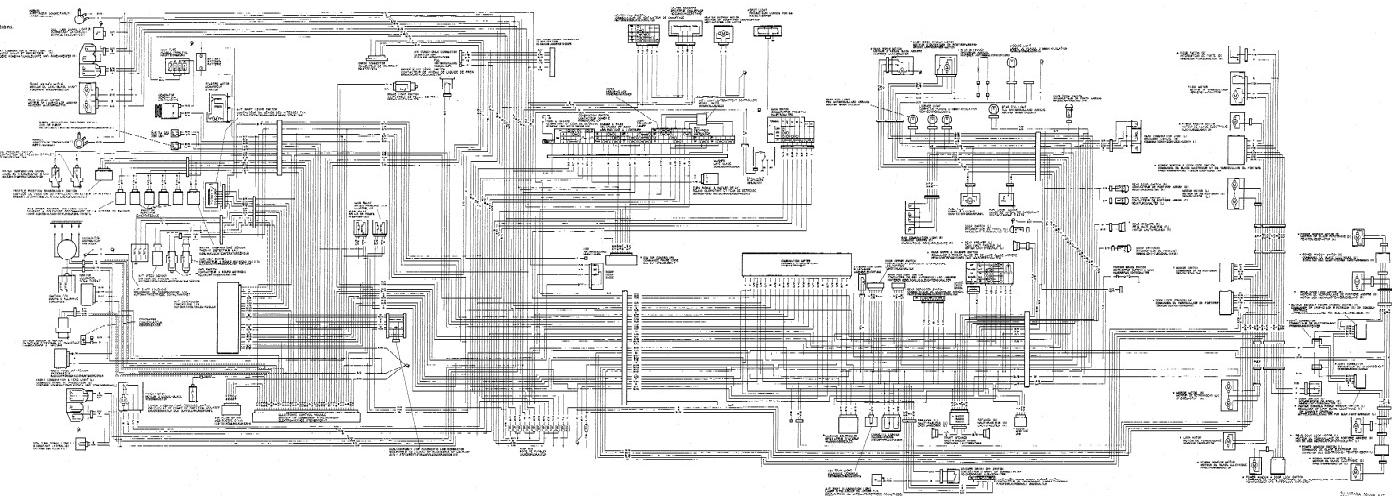
1 Right Hand Steering Vehicle with M/T
NOTE: Terminals with (*) are provided in accordance with specification.

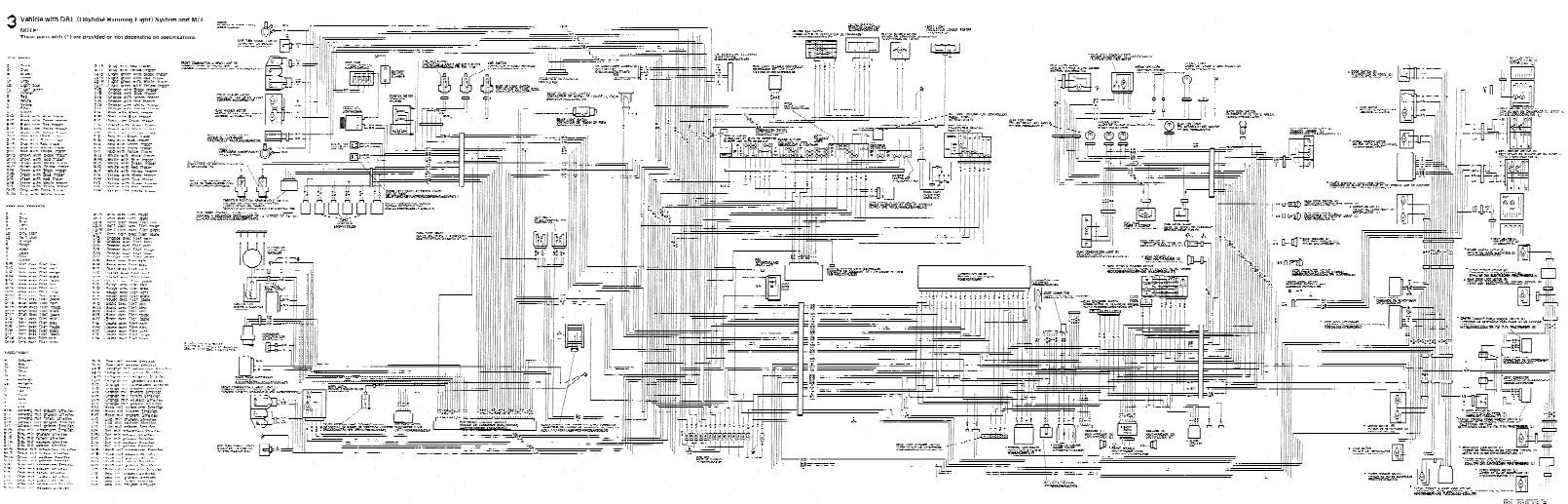


2 Right Hand Driving Vehicle with A/T

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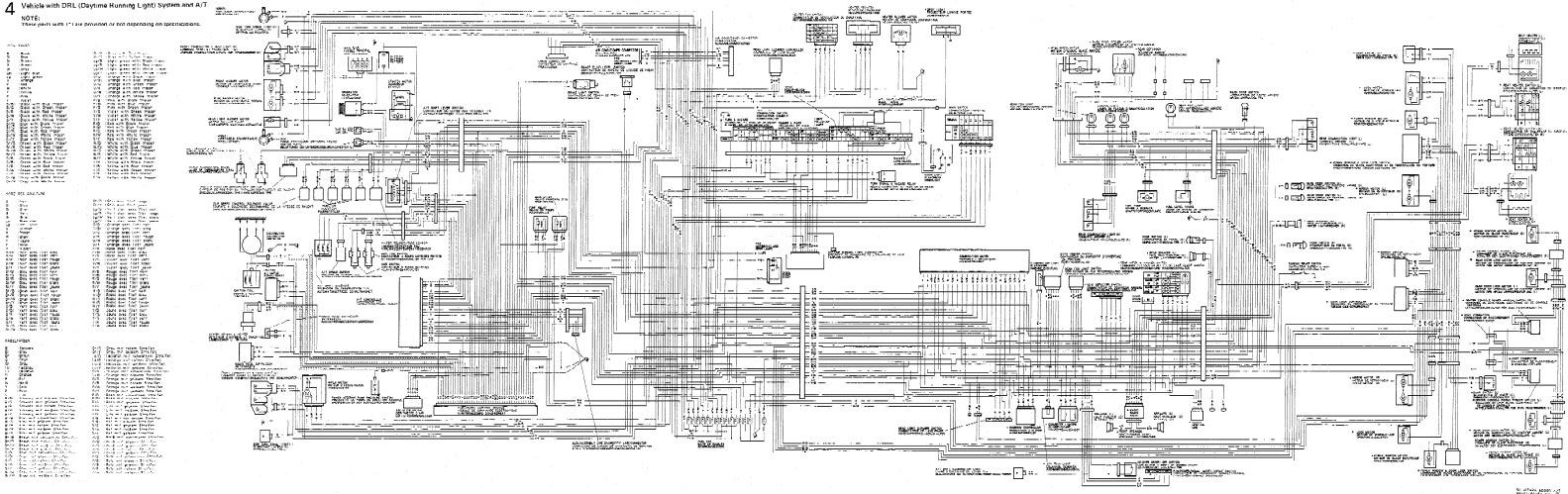
These parts with (*) are provided or not depending on specification.





4 Vehicle with DRL (Daytime Running Light) System and A/T

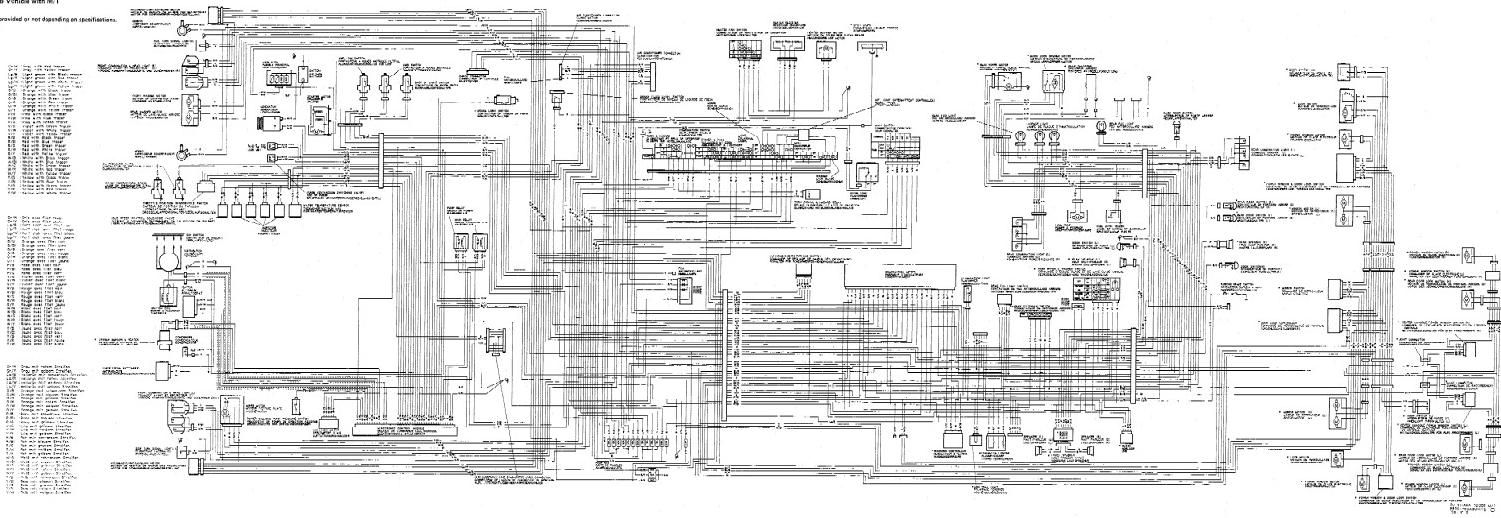
NOTE:
These parts are for reference only depending on specifications.

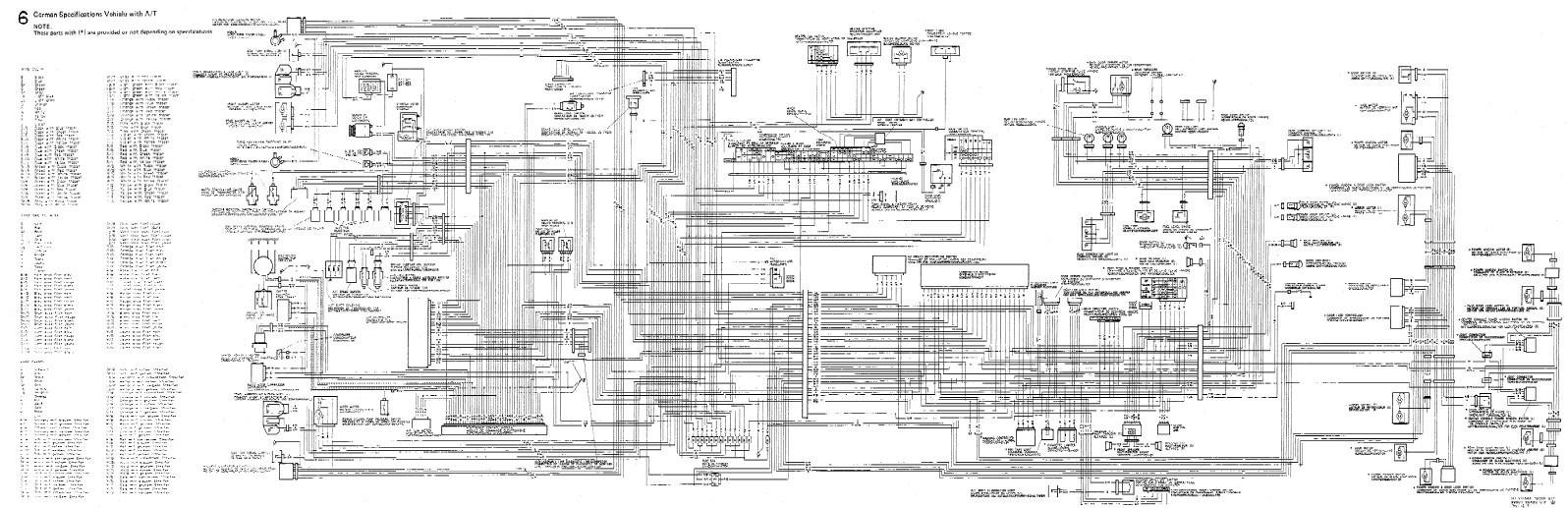


5 German Specifications Vehicle with M/T

NOTE:

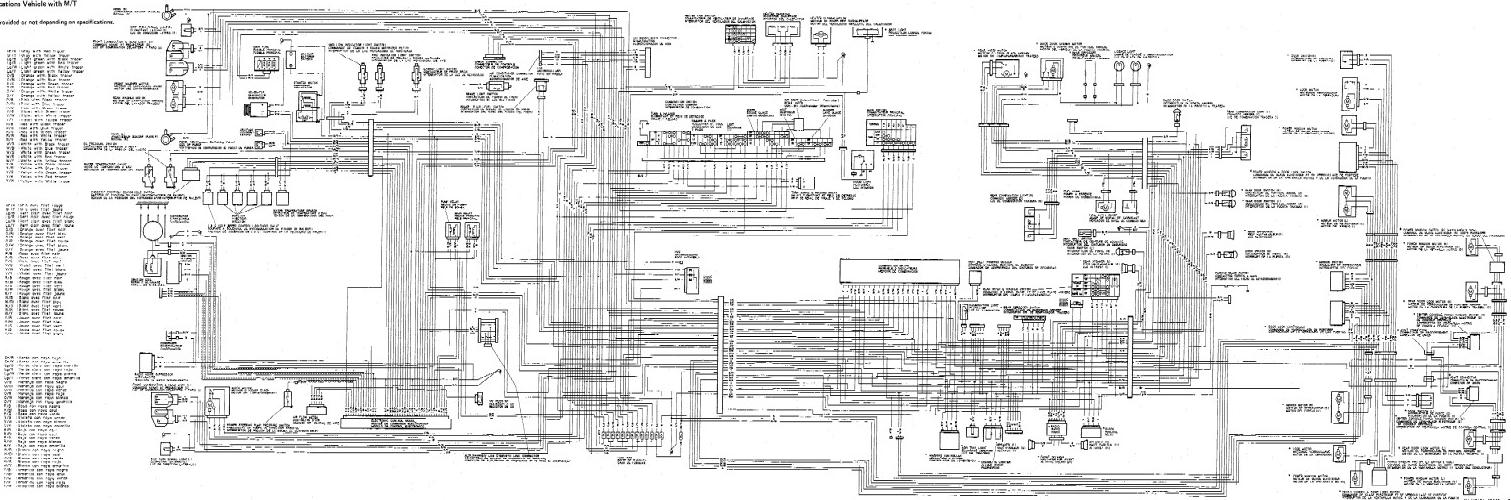
These parts with (*) are provided or not depending on specifications.

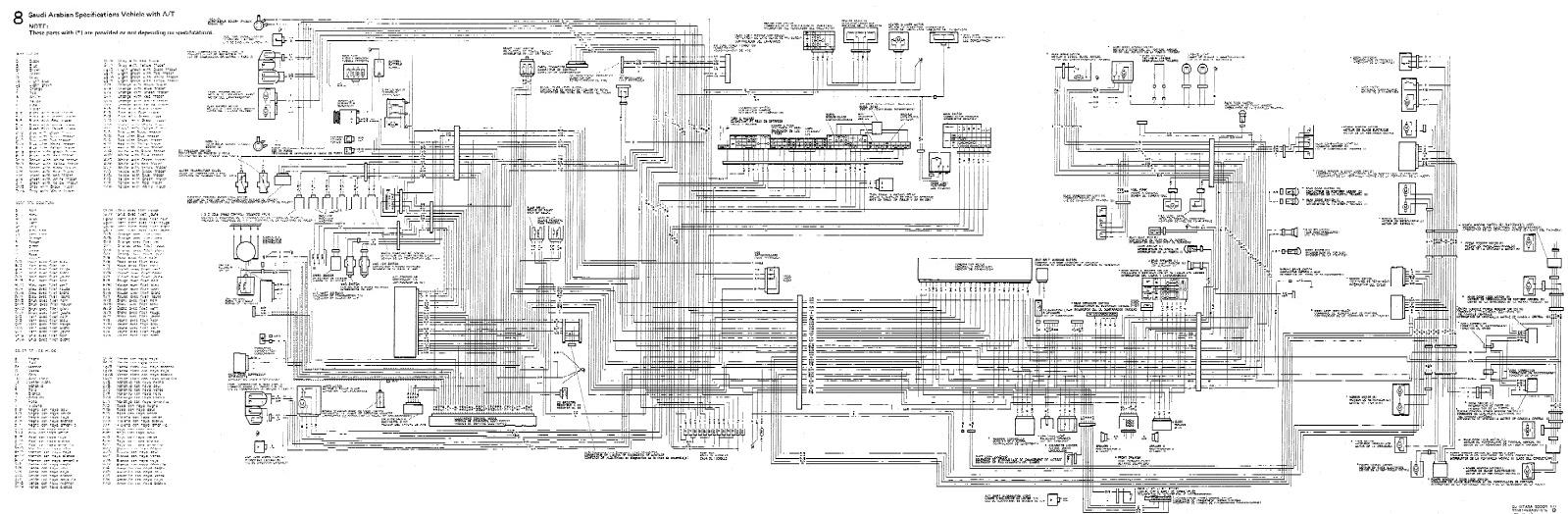


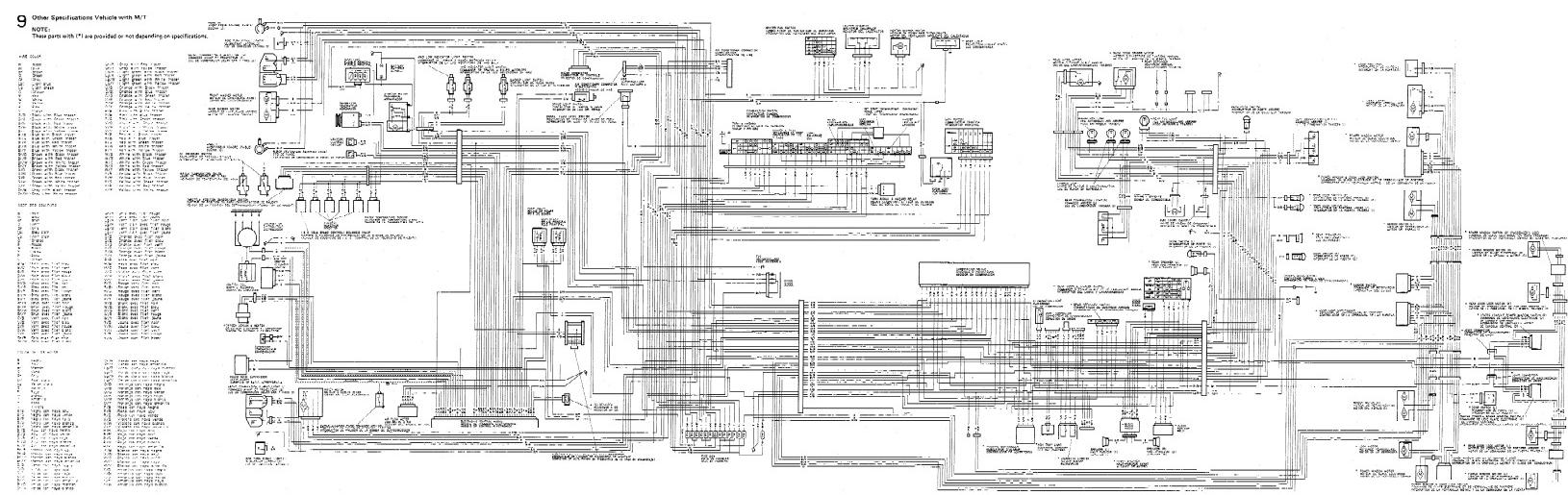


7 Saudi Arabian Specifications Vehicle with M/T

NOTE:
These parts with (*) are provided or not depending on specifications.



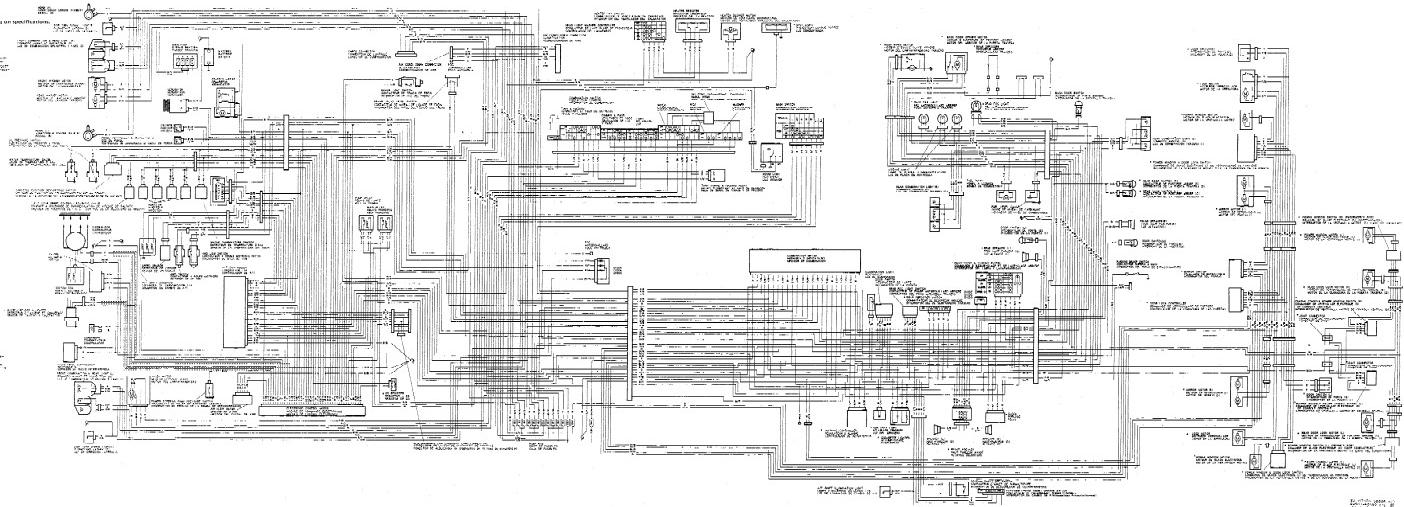




10 Inner Specification Vehicle with A/T

NOTE:

Three parts with (*) are provided or not depending on specification.



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